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**Committee on Food Research
FOOD ACCEPTANCE
RESEARCH**

Quartermaster Food and Container Institute

For The Armed Forces



**War Department
Office of The Quartermaster General**

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**T. B. LARKIN,
Major General,
THE QUARtermaster GENERAL**

COMMITTEE ON FOOD RESEARCH
CONFERENCE ON
FOOD ACCEPTANCE RESEARCH



U.S. QUARTERMASTER FOOD AND CONTAINER INSTITUTE
FOR THE ARMED FORCES
RESEARCH AND DEVELOPMENT BRANCH
MILITARY PLANNING DIVISION
of the office of
THE QUARTERMASTER GENERAL
WAR DEPARTMENT

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Chairman

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EDITOR'S NOTE

This manuscript does not constitute an official scientific publication. The authors have been notified that they may publish their material in technical journals and bulletins if desired.

Certain liberties have been taken with material submitted by the authors in the interest of uniformity.

GERTRUDE DACKEN
Captain, QMC,
Technical Editor

1 August, 1946
Chicago, Illinois

FIRST SESSION

THE PROBLEM OF FOOD ACCEPTABILITY

Thursday, 6 December, 1945

CHAIRMAN
LIEUTENANT COLONEL DON L. DEANE,
Chief, Food Research and Development Division,
Quartermaster Food and Container Institute
For The Armed Forces.

FOREWORD

A large task has been accomplished in obtaining and applying to the needs of the Armed Forces the technical information available from industry, research institutions and scientific literature. Already striking developments in rations have resulted, and improvements continue, but it is evident now that the available stockpile of technical knowledge requires considerable implementation to produce further information for the necessary changes that are indicated.

Toward the end of World War II it became apparent that certain questions were arising to which there were no immediate answers. For example there was a need for canned meat that would look and taste like fresh meat; for powdered whole milk that would resemble fresh whole milk, when reconstituted; and bread in a form sufficiently stable to resemble fresh bread. Those problems have the common characteristic of requiring fundamental investigations for their solution.

At the beginning of the war the Quartermaster Food and Container Institute placed major emphasis on nutritional adequacy, nutritionally balanced rations, but the real need was for an integrated program built upon the four cornerstones of military necessity. That is, acceptability, nutritional adequacy, stability and utility.

The acceptability phase of military necessity has been formulated into a food acceptance research program, now under way, comprising four main divisions:

Food Habit Studies: Food habit studies on the optimum frequency rates with which foods can be eaten, national versus regional food preferences, food variety preferences, food preparation preferences, racial, sexual and age differences, food idiosyncrasies and food patterns.

Psycho-Physiological Studies: Psycho-physiological investigations into how thirst and appetite function, foods that inhibit or accelerate thirst and appetite, belly-filling properties, satiety, the significance of spicing and blandness, and the separation and delineation of the psychological and physiological factors affecting acceptability and appetite.

Organoleptic Studies: Organoleptic studies under controlled laboratory conditions for the purpose of working out rapid and reliable methods for screening products to ascertain food preferences, and to assist in product development and improvement.

Statistical Theory: Statistical theory for the design and interpretation of experiments.

This publication is a report of a conference held at the Quartermaster Food and Container Institute for the Armed Forces in December, 1945. The conference was designed and directed by Dr. W. Franklin Dove, Chief of the Food Acceptance Research Branch, for the purpose of making available background information necessary for the nationally coordinated Food Habits Survey now being conducted by the Committee on Food Research.

Research investigations on the second, third and fourth phases of the Food Acceptance Research program, outlined above, are described in QMC Manual 17-8, entitled Committee on Food Research, Research Program, 1945-1946. In the near future a manual describing the program of the Committee on Food Research for 1946-1947 will be available.

GEORGE GELMAN,
Technical Director,

CHARLES S. LAWRENCE,
Commanding Officer,

QUARTERMASTER FOOD AND CONTAINER
INSTITUTE FOR THE ARMED FORCES

THE PROCESS OF DEVELOPING FOOD ACCEPTANCE RESEARCH

by DR. W. FRANKLIN DOVE, CHIEF, *Food Acceptance Research Branch*,¹
QUARTERMASTER FOOD AND CONTAINER INSTITUTE FOR THE ARMED FORCES, CHICAGO, ILLINOIS.

At present there appears to be in process of development a science which treats of foods and the consumer of foods as a relationship in which both the producer of foods and the consumer of foods share an equal interest.

During World War II, recently ended, each item of Army rations had been carefully produced and prepared according to quality specifications, and each item had been tested to contain and retain, through long periods of storage, its quota of vitamins, minerals, protein and calories. But when the soldier - consumer refused to accept some of these ration items, and when these items began to accumulate in the storage dumps in various theatres of the war, a new problem in supply, theretofore unrecognized, became a major issue. To determine the causes of non-acceptance followed as an official directive.

It is relevant to the historical background of the subject to add that parallel with the refusals by soldier-consumers, populations under economic stress, or belabored with a poor soil, or lost in the forest fringes, or in marginal environments, or seduced into over-specialization, reveal similar conflicts in the acceptance and non-acceptance of foods. The reasons for this parallel will appear with further development of the subject. Needless to say, both the Army population under stress and a civilian population isolated from the normal balance of supplies, even though it may be living in the midst of a prosperous society, have much in common.

¹Research in food acceptance was formally introduced into the Army's food supply program with the establishment, in November 1944, of a Food Acceptance Research Branch in the Subsistence Research and Development Laboratory, under Colonel Rohland A. Isker, Commanding Officer.

WHY THE SUBJECT OF FOOD ACCEPTANCE HAD NOT BECOME AN ISSUE BEFORE

To answer this question, and to uncover causes, as a step toward instituting prevention, a few decades of the past should be reviewed.

Not so long ago there was little need for concern over the non-acceptability of the harvest. Each family was largely self-sufficient. Out of the family garden the seed for the coming year was selected and only the best was chosen. That best of the harvest was judged at the family table by means of a sizable panel of children and parents, aunts and grandparents, which represented all ages and both sexes.

Locally adaptable varieties of sweet corn, apples, squash, peas and beans were bred on the spot for acceptability, and were also prepared and cooked in home style. Home cooking meant recipes devised out of the ingredients at hand and upon which the family panel had also placed its stamp of approval. These home recipes had sometimes passed through the judgment of generations of families. As the seeds from the best-flavored or the finest-textured foods were saved, so too were the favored methods of preparation and cooking passed down from mother to daughter or from mother to daughter-in-law. A Maine author records that sometimes a marriage depended upon the bride's ability to learn how her mother-in-law cooked.

The family taste panel passed judgments daily, three times a day, from a breakfast for work to a supper after work, every day of the week from Monday's labors to Sunday's rest, and throughout the seasons from rain, to heat, to snow. Though subject to the influences of imitation as with a child aping one of its parents in the choice of food or of domination as with a parent punishing a child by depriving

it of dessert; or of urging as with a mother who in concern for the wellbeing of the sickly child persuades him to drink milk; or of resistance as a form of a child's self-assertion in refusing any or all foods presented. Nevertheless the vocal judgments of the family taste panel varied from unanimous veto against the food to unanimous acclaim for it. The family taste panel passed judgment upon many characteristics conceded important in today's scientific panels:

They judged:

The odor, appearance, flavor, texture and temperature;

The frequency, monotony, or amount served;

The variety grown and even, indirectly, the nature and fertility of the garden soil;

The methods and temperature of storage as these conditions affected keeping quality;

The keeping quality of the raw food or as cooked and sealed within the jug, barrel or jar.

All of these judgments combined into a family chorus came to expression in the food habits of the consumers and finally shaped the pattern of agriculture in every region.

During these earlier times there were segments of the population isolated from the soil and consequently subjected to limited diets but for none of these did concern over taste, flavor and acceptability rise to the level of social or economic or scientific importance until recent times.

It can be conjectured that this gradual rise to awareness of the problem of food acceptability is the result of a gradual change taking place during the past century toward commercial agriculture with quantity production as the chief goal, together with widespread production by the great food industries of processed and canned foods for the market, while the original strings of taste authority in the family, as producer and processor and consumer, were severed one by one.

By slow but certain strokes the family's seed stock was replaced by nursery seed stock, by the stock of large commercial seed houses, by

the stock of state and federal government experimental seed plots, seed stocks which were developed for resistance to diseases and for high yield. By the same slowly changing pattern of life, the family's home-canned foods have been displaced by the standardized, colorfully-labelled commercial product. The advantages to these changes are greater than they appear on the surface.

While the civilian consumer's food-forming habits have changed so too have the methods of feeding armies. The mechanized warfare of World War II required combat and assault rations which possessed operational characteristics, such as ease of handling, compactness, keeping qualities, plus nutritional adequacy and acceptability. Such requirements increased the need for quantity production and for commercially processed, dehydrated, cooked and canned foods to keep up with the rapid surge of huge armies. Such armies, as in the Normandy campaign, must travel fast or as in the Pacific Islands units which might be separated for long periods of time from the normal supplies of fresh perishable foods. For the first time in history large groups of men lived for long periods of time solely on commercially produced and processed foods..

Limited and imposed diets, often consumed under stress, tested severely the nutritional adequacy of rations and even more their acceptability. No matter how adequate these foods and rations were nutritionally, only insofar as they were accepted were they a dependable conveyor of nutriment.

With acceptability of foods in this salient position and with our continued interest in mass feeding, the need has arisen for a careful screening of all scientific researches and methods which might contribute to the evaluation of foods for acceptability. Neither the food producer nor the processor nor the consumer, soldier or civilian, can afford to allow food acceptability to remain in its past-present unorganized form. All indications are that postwar developments in foods and in feeding, as well as in other approaches to the biological aspects of man's adjustment to his environment, will make extensive use of the scientific advances that may be made in these directions.

The science of genetics has taken the guess-work out of seed selection for disease resistance; food technology and experimental cookery have taken the guesswork out of food processing and food preparation; the science of nutrition has taken the guesswork out of the plus factors in foods, while physiology has devised accurate measures of the physical and nutritional status of the consumer. But by this modern, efficient, centralized production and processing of foods on the one hand, and by the recognition and supply of the major and minor nutrients required for abundant health on the other hand, we have left out the relationship, or the connecting link, between the living subject and the food he lives upon. That link is acceptability.

Now is the time when the essence of the family taste panel which has been lost must be returned. Not as it was but in a modern scientific form of following the food from its seed through development and processing, to the finished or even assimilated product. Such a science if properly developed is destined to contribute to consumer and producer alike.

WHO WILL DEVELOP THE SCIENCE OF FOOD ACCEPTANCE

Since food acceptance, as someone has aptly remarked, is an in-between study, its proper development will depend upon the combined interest of numerous special approaches.

It should include those who have attempted to grade foods for quality for government or Army specifications, since an application of the blind panel of judges selected on proved ability to test the food or item and according to a reliable statistical design, provide unbiased decisions and scientific quality control.

It should include those interested in psychometrics, to standardize the quality control methods used for liquors, tea and coffee, and apply them to milk, eggs, beverages and to all classes and kinds of foods.

It should include those in food technology and home economic who have used organoleptic methods to determine chemical or physical changes in foods treated or stored in numerous ways.

It should include the biological sciences concerned with self-regulation, or with the embryology, anatomy or physiology of the sensitivities related to food-getting and to appetite and hunger.

It should include those interested in social psychology and anthropology, to indicate the background of forces in which food-getting has been reared.

It should include the economist to deal with physiological demand in contradistinction to market demand.

Specifically it should be the concern of the nutritionist who may consider food selection as a part of psychology, and the psychologist who may consider food selection as a part of nutrition. It should also continue to tantalize the chemist, who will always try, and may some day succeed, in detecting differences and trace dilutions with an accuracy equal to that of all the gustatory sensitivities. Furthermore, it should interest all who have studied food habits of populations and have tried to make something tangible out of individual differences in preferences, prejudices, likes and dislikes.

Finally, it should interest those who are administrators of research since food acceptance techniques provide direction from the consumer. In other words, food acceptance tests are on more than a mere service level since in addition they may be used not only to develop a product from a correct combination of parts, but also to indicate what foods to develop and what direction to take. As such they serve the administrator and should therefore be free of any compartmentalization which would disturb their functional nature.

To develop the subject of food acceptance as a unit of research, the Food Acceptance Research Branch of the Quartermaster Food and Container Institute for the Armed Forces has included in its physical plant the facilities for as many of these approaches as seemed feasible for the purpose of developing acceptable rations, and has relied on various research laboratories of the country to carry on correlated research where the best talent, ability and equipment exist.

Thus the Food Acceptance Research Branch includes in actual concrete structure the facilities for a large number of the potential functions of such research. The statistics of sampling and of design and of results; the physiology of sensitivities and the psychology of attitudes; the physico-chemical tests of the quality of foods; experimental cookery as related to preference; psychometrics and organoleptics. Each of the divisions of interest may be likened to a part of a car. Organoleptics or psychometrics may be the wheels, consumer likes and dislikes (physiological-psychological or anthropological) the car body; while experimental cookery may be likened to the shock absorbers and upholstery. No single part can assume the prerogative of the whole.

During the last six months 215 test for acceptability have been run on 708 items of food. The foods tested included every food class; soups to nuts with meats, potatoes cereals, fruits, beverages, vegetables, desserts and confections in between. Entire rations also have been tested. All of the items intended for rations are now tested for acceptability before they become rations. The same techniques are used to determine by taste test panels the best methods, from the standpoint of acceptability, for packaging and storing and the optimum keeping time or shelflife.

Such research is new. New methods have had to be devised for nearly every class or type of food. Each food presented for test offers a special problem which must be analyzed through careful discussion with commodity specialists and with others interested in the development of the product. The results of the tests are presented as memoranda for administrative action, for further development or for use by the procurement officers as one of their guides in purchasing supplies. The purchase of the winter's supply of breakfast cereal, for instance, may be influenced by panel judgments as to brand, composition, method of toasting, and so on.

The results of these tests also are being prepared for publication as research papers, since methodology at present is the crux of testing. Without reliable methods the tester and his

results are at the mercy of personal opinion. Several points which characterize these new methods include the following:

1. A panel of judges is selected for ability to detect the differences expected to arise.
2. The test is blind, without comparison of notes by the judges.
3. A record of differences is secured, together with word records to express the differences.
4. A record is kept of both positive and negative attitudes toward the differences.
5. There is a statistical design in the experiment to measure all variables separately and together and establish significance of results.

When the tests are carried out according to these and other precautions, the results may then be considered reliable. Further tests in camps or in the field must be made to evaluate the relative preference for these foods by the group as a whole. The results show, however, that many totally unacceptable foods can now be eliminated before they enter ration; that many foods are preferred only by part of the population and must therefore be accompanied by substitutes: that some items are so well liked and fortunately so stable in the storage method indicated that procurement can proceed with confidence. For example, the best variety of peas as tested by the blind panel turned out to be the variety requested most often at the grocery store. Such results indicate actual use value of the methods.

But, as previously indicated, this laboratory approach is not sufficient in itself. Preference for or prejudice against a food is a population problem. Attitudes toward foods relate particularly to food habits built up over the years from birth to maturity. Furthermore, food habits represent regions. They are related to the soil,

to the climate, to the food crops, and to the socio-economic and even religious characteristics of each region. The final effect of food habits upon the civilian and soldier consumer from each region should be measurable in terms of physical stamina and success in adjustment in times of stress.

A special development of food habits, through this laboratory, is the subject of acceptance rates of foods. The Committee on Food Composition of the National Research Council has compiled tables on the nutritive value of American foods. The nutritionist, however, needs additional information to devise rations and evaluate foods correctly. The nutritional value of each food is not measured alone by its nutrient content per 100 grams, but rather by the nutrients in the total amount of each food accepted, and of that, the amount assimilated and utilized. The issue is direct, the arithmetic simple. *Each food must be evaluated not by what it possesses but by what it gives to the consumer*, and it gives to the consumer in gross

value its percent value per unit weight times the weight of food accepted. Acceptance rate in turn depends upon a chain of events and influences, any one of which may negate the chemically high nutrient quality of foods. Thus the acceptance rate waits upon the degree of preference, depends upon form and method of preparation, is hindered or facilitated by differences in flavor of the different genetic varieties, and is influenced by its physiological effect upon and assimilation by the individual. In the end food habits, through acceptance rates, mould the physical status of the consumer, both soldier and civilian.

Out of conferences such as this one may arise new ideas for research. The latest ideas, no matter how contrary to present practices, have a refreshing effect, help to unravel the puzzles of nature, and reveal the controls essential for wise action and for the optimum adjustment of human beings to their environment.

FOOD ACCEPTABILITY TESTS IN THE ARMY

by CAPTAIN R. O. RAUB, *Subsistence Division, Food Service Branch,*
OFFICE OF THE QUARTERMASTER GENERAL, WASHINGTON, D. C.

Food acceptability is simply a question of which foods will be eaten. If no other food is available except canned rations, the average soldier will consume them. But does the average soldier like that food? As soon as choices are presented, food acceptability becomes a very important element. If the average soldier does not like a particular item he will refuse to eat it. As a peacetime Army develops the problem of food acceptability becomes increasingly serious because the average soldier will have increasing opportunities to decide which foods he will consume and which ones he will refuse. Food acceptability has long been a matter of concern in the Army and it will be given increasing consideration during the peacetime years.

Food acceptability has both morale and economic effects in the Army. The morale element is apparent. If acceptable food is served, morale improves but if the food is not acceptable, morale deteriorates. The economic factor is not as clearcut and it carries several ramifications.

To appreciate the part that food acceptability plays in the present plans and procurement program of the Army's vast food supply system, it is desirable to review briefly the manner in which food finds its way from the agricultural region of the country to consuming soldiers located throughout the world. The consuming soldier is the average soldier so far as food acceptability is concerned. The tests that have been conducted on food acceptability have all been centered in the average soldier rather than particular ones. This must necessarily be the case in view of the large number concerned and the size of the food procurement and preparation program. The average soldier fed at permanent posts and temporary camps throughout the world is subsisted on the field ration

system. A master menu drawn up by the **Menu Planning Branch of the Subsistence Division** Office of The Quartermaster General, is used as a basis for the procurement, preparation and serving of food to troops. This menu, based on the nutritional requirements established by the Office of The Surgeon General, is designed to give soldiers approximately 3800 calories of food daily and the other necessary nutritional components. The system is designed to provide ample food for every man. The Master Menu is published and distributed to posts, camps and stations throughout the country well ahead of actual consumption dates so that ample time may be available for procuring the necessary items. Menu Boards composed of the Post Surgeon or his representative, the Sales Officer, the Post Food Service Supervisor and representatives from organizations located on the post, review the menus as received and make necessary substitutions. These substitutions may be based on availability, or the likes, dislikes and food preferences of the troops concerned. For instance, if it is felt at a camp that spinach or squash will be consumed in smaller quantities than the amounts listed on the Master Menu, other items having better acceptability and in the same food class may be substituted. Until food acceptability tests were instituted substitutions were made on the basis of opinion, not fact.

Information as to the likes and dislikes of food were no more reliable than the methods used. The methods were personal observations, waste studies of the contents of garbage cans and an examination of excess items returned to sales commissaries because they were not consumed in the quantities issued. These methods, although helpful, were found to have disadvantages. Menu boards, through lack of experience, were not always able to decrease or increase

issues without considerable experimentation; continuous changes in personnel and the wide geographical origins of men stationed at each post created new problems of likes and dislikes; factual records of food preferences were not available to posts, camps and stations. Each one had to make the necessary changes itself, thus expending the same labor at each post and duplicating efforts. A means was sought by which actual consumption rates could be established so that purchases of food and even the growing of food items for the Army could be controlled. This led to surveys conducted by the Food Service Branch, Subsistence Division, Office of The Quartermaster General.

In December 1944, one camp was selected at which to make a complete study of the utilization of the Army ration. At this camp five messes were surveyed. All food prepared for consumption in Army kitchens was carefully weighed when received at the kitchen. Preparation losses incurred in the trimming and processing of vegetables and meats, losses in cooking and waste from plates were recorded. Records were made of consumption levels. Concurrently an evaluation of a means of obtaining food acceptability was undertaken. It was thought that a mimeographed form could be filled out by mess sergeants, including a statement on the form whether or not the cooked product was prepared well and had a good appearance, and they were to supply other information to show the quality of preparation. This method proved unsatisfactory since each mess sergeant stated that the food in his kitchen was uniformly well prepared but unbiased investigation showed that this frequently was not the case. This method of food acceptability testing was abandoned. Later, food acceptability tests were run in conjunction with ration utilization studies. They are a decided improvement over earlier methods.

Food surveys in Army Service Forces messes follow this improved method. Messes in the Army feed, in the majority of cases, cafeteria style. The cooked weights of all foods prepared for serving are recorded. Following the serving period the weights of all leftovers are obtained to determine quantities of food served and quantities left over. Actual plate waste of items

is also recorded to arrive at the total number of pounds of each item consumed during each meal. Each item is graded as to the quality of the finished product. Surveys are run for seven consecutive days. An accurate check on the number of men going through the line is made by the survey team. At each meal one item is selected for food acceptability testing and the number of persons accepting the item on the cafeteria line is recorded. This number, when compared with the number of men going through the line, determines the percentage acceptance of the item selected. In conjunction with the item selected for food acceptance a complete record is made as to the quantity of the item used in its raw state, the weight of the preparation losses such as peelings and trimmings, and the cooking loss or gain.

Standard processing losses and conversion factors have been established by the National Research Council but the data for the tables were not based primarily on Army messes. Present preparation losses in Army messes are known to vary. In the case of potatoes they range from a five percent peeling loss to as high as 30 percent, depending on the zeal of the KP who wields the peeler.

The troops are classified in three groups according to their work, as the very active, the moderately active and the sedentary. Types of troops studied include white and colored, enlisted men and enlisted women. Observers who record the data for the surveys are all highly skilled mess sergeants and members of the instructor staffs of the schools for bakers and cooks of the service command concerned. The grading of the quality of the item prepared is therefore accomplished by disinterested experts and not by the personnel who prepared the dishes.

Surveys of this nature have now been accomplished in six of the nine service commands. Three service commands and the Military District of Washington have not as yet been surveyed. Survey teams are trained in the service commands and food acceptability studies made at each survey, thus establishing a flow of food acceptability information to the Food Service Branch, Office of The Quartermaster General. The studies are considered

representative in that the surveys include classes of Army personnel with wide ranges of activity and troops whose homes are located in every state in the union. The number of meals surveyed in this manner totals 288. This represents an aggregate meal attendance of 49,685 persons. From the information thus far obtained reductions in the issue quantities of certain unpopular foods have been made. This procedure will result in substantial savings to taxpayers. Further reductions will be made as soon as supporting data can be secured on other less acceptable foods. At the same time the more acceptable foods are increased, thus making it possible for the soldier to receive ample nutrition and to satisfy his particular desires in food.

One of the greatest problems determining food acceptability patterns is the number of variable factors which can influence food acceptance. The first variable is the number of times an item is served or the frequency of serving. Naturally if a person is served spinach five times in one week, his liking for this vegetable will not improve. Similarly if a large number of left over items are placed on the serving line the food acceptance of regular items on the menu will suffer. The third factor is the large number of daily events that concern troops. Orders changing assignments or stations, a baseball game, a night problem, parades, extreme exhaustion, weather, arrival of a package from home, visits to the post exchange for

candy and ice cream, all affect the acceptance of the foods being served. These factors combined with the differences in preparation of food, its attractiveness and palatability will cause one to doubt if food acceptability studies can provide definite conclusions. The studies do show definite trends, even though there are extreme variances in particular instances. The variables exist under normal conditions and in the final consideration these same factors tend to show acceptability of items as they are and not as they would be under ideal conditions.

The studies which have been accomplished, and for which a preliminary list of items have been prepared are not to be construed as a final standard upon which to base the acceptability of any food item. The list merely shows a trend in the surveys to date. If studies of this nature were to be conducted for a sufficient length of time, data might be established upon which the Army could base its planning and procurement to much better advantage. In view of the present size of the Army and its probable proportion for some time in the future, it is especially important that the acceptability of food items be considered very carefully. Commercial processors of foods will not prepare a huge amount of foodstuffs unless they have concluded from their studies of the market that the food will be acceptable. The Army should not be an exception. Food acceptability tests will help the Army to use the same foresight that commercial processors are required to practice.

SECOND SESSION

FOOD PREPARATION AND SERVING METHODS AND THEIR RELATION TO FOOD HABITS AND NUTRITION

Thursday, 6 December, 1945

CHAIRMAN

LT. ROBERT P. MCDEVITT,
RATIONS BRANCH.

*Quartermaster Food and Container Institute
For The Armed Forces*

INFLUENCE OF FOOD PREPARATION METHODS ON ACCEPTANCE IN THE ARMY

by MARION BOLLMAN,

Quartermaster Food and Container Institute For The Armed Forces, Chicago, Illinois.

Food preparation, as the Army has understood the term during the past four years, covers the preparation of more types of food under more varied conditions than probably has ever been encountered before.

Army food preparation covers the problems arising from serving one issue diet to millions of men from all economic levels and from all sections of the country. This diet may consist of ordinary foods prepared in planned and fully equipped kitchens, it may consist entirely of canned and dehydrated foods prepared in hastily constructed field units on gasoline ranges or it may be the preparation of a meal by one man in a foxhole using improvised heating facilities and utensils.

The aim of all the work that the Army has done on food preparation problems has been better food acceptance. Acceptability is the first requisite for all food even when planning an emergency ration for a life raft. It matters little how much food is issued or how nutritious that food may be if the soldier does not consume it. The scope of the whole problem of food acceptance, even when limited to food preparation, as it existed in the fully mobilized Army, is too large to cover in detail here. There are only a few phases that require particular attention.

It is not hard to realize that even under ordinary conditions and using an ordinary menu in a food operation of this magnitude that many acceptance and preparation problems would exist. The first handicap is that food in the Army is issued to the soldier. Psychologically just the word issue creates a negative reaction in the minds of the men eating in the mess and in the mind of the cook preparing the food. A man misses the privilege

of selecting a meal from a wide variety of foods on a menu or having his chicken prepared in his favorite style at home. Deprived of his personal choice and being forced to adapt his tastes literally to millions of others, he is apt to be most critical of the food served. This critical reaction in turn creates a poor attitude on the part of the cook. If he is issued an item that he knows has previously been unpopular, usually he expends as little thought and time as possible in its preparation because he feels that it has limited or no possibilities.

Here is food preparation with a new twist. Instead of devising the best and most acceptable menus and recipes and then requesting the ingredients, the menus are specified and the ingredients issued. Under ordinary food operations if a food is extremely unpopular it is limited or even eliminated from the menu. In Army feeding the cooks take what is issued and from then on it depends upon the cooks alone to satisfy the needs of the troops.

The Subsistence Division of the Quartermaster Corps has found through its work on the Army Master Menu that corn, stringbeans, peas and tomatoes were the most popular vegetables, whereas lamb, fish and liver were the most unpopular protein foods. What causes the popularity of one item and the unpopularity of another? If this unpopularity does exist, can anything be done to overcome it? This was the type of problem that the Army started working on in August of 1943.

Fish was one of the most unpopular items on the menu because, as reported, soldiers generally dislike fish. It was being served once a week and on fish day 20 percent of the personnel failed to attend the meal. Only 50 to 60

percent of the fish prepared was eaten. Why the universal unpopularity of an item that frequently appears on menus in many sections of the country? The results of a survey showed that the largest determining factor was the method of preparation. The ordinary Army cook knew very little about cooking fish. His attitude was that fish was unpopular, he had to serve it once a week, but the men didn't like it, they weren't going to eat it, so why take any time or trouble in the preparation. Frying was almost the only method used. In camps where sauces or garnishes were served the consumption was invariably higher. Almost all camps provided better preparation directions.

It was decided that if a limited number of good recipes could be formulated, especially adapted to Army use, tested for acceptability and then distributed, it would at least be a step in the right direction. In cooperation with the National Wildlife and Fish Service the program was set up and this laboratory's personnel were elected as guinea pigs for acceptability tests.

The popularity of the Kitchen Research Section fell several degrees when the tasters found that they were launched on a long term fish program. Immediately it was obvious that this group was especially good for this type of testing. The number of so-called customers at once dropped off on fish days. Most of the group had a pre-prejudice attitude against fish in any shape or form. Many of them had never tried some of the varieties. For example almost 15 percent of the tasters had never eaten an oyster. If an individual could be persuaded to taste the first oyster invariably he would be the one to go back for a second or third helping. An effort was made to prepare the fish in what was considered its most acceptable form and to serve it in the most attractive and adaptable style. It was noted throughout the testing period that there was a steady increase of customers on fish days and by the end of the experiment almost the entire group was being served. This change of attitude although not 100 percent shows how proper preparation can influence acceptability of even an unpopular item.

Another situation that creates an acceptability problem is the fact that the Army has to satisfy individuals of varied eating habits.

Selling hominy to the soldier from Nebraska is no small chore; while at the same time the man from Georgia welcomes it. When these two men are eating from the same menu and maybe at the same table it is a real problem. Does the man from the North object to the hominy itself or the Southern style of cooking? Here is an experience unique along this line but is offered by no means as a positive answer. During a feeding study conducted in Kansas to determine the comparative acceptability of Army rations under special conditions an Army mess was operated on a 24-hour basis. On the day that hominy appeared on the menu the plate and kitchen waste of hominy from the first shift was very high while the waste of the same item from the second shift was extremely low. Upon investigation it was found that the only difference was in the method of preparation. The cook on the first shift prepared it in a characteristically Southern style while the cook on the second shift was completely ignorant of the usual method of preparation. Calling upon his own ingenuity he baked it with a cheese sauce in much the same way as macaroni and cheese. This method of preparation was more familiar and the men ate it, probably never realizing that it was hominy.

This same problem arose when it came to devising a good formula for dehydrated baked beans. There is a large difference in what a New Englander considers good baked beans with his preference for a molasses sauce, and what a Middle Westerner considered good with his preference for a tomato-type sauce. Numerous acceptability tests failed to convert either side and no doubt many of the complaints from the field regarding the quality and flavor of this item came from soldiers of the opposite baked bean school.

Real problems in food acceptance came in feeding the overseas soldier. Of necessity the food that was sent was unfamiliar in flavor, appearance and preparation to the men eating as well as those who were cooking. Most persons connected with the Army feeding program had no illusions regarding the relative acceptability of most of these new items. Dehydrated vegetables were a substitute for fresh veget-

ables, dried eggs were a substitute for fresh eggs and canned meat was a substitute for the fresh or frozen variety.

It didn't take long to find out that soldiers didn't like new taste sensations. Overseas or not they wanted foods similar in flavor and appearance to those at home. The Quartermaster Corps attempted, as far as military necessity would permit, to supply food as it was served in the United States. It is not necessary to go into a discussion of why this was impossible in most cases. Everyone is familiar with the problems of long supply lines, limited shipping and storage space, lack of refrigeration and extreme climatic conditions. In the instances when it was impossible an attempt was made to develop a suitable substitute. Sometimes the effort succeeded, at times it partially succeeded and at other times it failed. Here again the acceptability of the final product was one of the main factors which pronounced it a success or failure.

However, in these special items there were more acceptability complications which in turn put a greater burden on preparation. Usually an entire new method of cooking had to be used. Many an Army cook or even an Army dietitian in the early part of the war had to use dehydrated foods with no previous knowledge of the method to use. They did not know how to prepare them and had no idea what the finished product should be. A cook's knowledge of how to prepare, for example, a fresh potato, was of little use when he met the dehydrated variety. One group in 1942 had eaten dehydrated potatoes for months and each batch of mashed potatoes, as a soldier so aptly put it, could be eaten with a straw. The cook who was preparing them thought that this was the only possible result and made no attempt to alter his method of preparation. He was amazed when a trained cook prepared a good mashed potato from the same product. Of course this group, after this sad experience, had no taste for dehydrated potatoes or dehydrated food of any kind. In just this way much of the prejudice against these items developed. It was important that recipes be formulated that were adapted to these special foods and that the mess personnel receive a special course in how to use them.

Even after personnel had been properly trained careless preparation accounted for the low acceptance of many special items. Dehydrated foods especially are far more dependent upon care in preparation for good acceptance than the fresh variety.

There were other factors which influenced the flavor of the foods before they reached the hands of the cook. Many changes took place in the production or processing and other changes took place in storage. These changes could be detected in the finished product and put still another burden on the job of preparation.

For example chemical changes affecting flavor occurred in dried eggs after three months in storage, especially at elevated temperatures. The Army supply line was nine months long so that unavoidably flavor changes at varying degrees were going to be present in the eggs when the cooks received them. The job of formulating recipes included finding a method of preparing these eggs that would disguise the off flavors that might be present. This problem was solved by preparing the eggs in every way except plain. Always a flavor that was sufficiently strong to overcome the off flavor was added. Pork sausage, bacon, creole sauce and such additions were used. Ways of using eggs that were too badly off for table use included putting them in baked products. Canned meats lack the meaty flavor which gives zest to a meat dish. This was solved by adding extra meat flavor in the form of bouillon cubes. Hams were excessively salty and required long soaking, many changes of water and long simmering to make them palatable. Chocolate, spicing of various kinds and even fruit juice were added to help overcome objectionable flavor present in beverages made from dried milk. These and many other concoctions were used to increase acceptability.

Still another problem arose. A product that originally had a high acceptance would become most objectionable if served too often. Even in this country this occurred from time to time. During the beef shortage the mere mention of a pork roast would turn a mess sergeant green.

Overseas pork luncheon meat and vienna sausage were the common offenders. They are both good products if not taken in too large

quantities. Whether the high spicing of these items had an influence on their repeated acceptance or whether they were merely the items most frequently served has not been definitely determined. The main error was their constant repetition on the menu. The usual solution for an acceptance problem of this kind would be to limit the number of times the item would be served. Since the supply was not easy to control the situation was improved by disguising the food and thereby relieving the monotony by giving it a different shape, flavor and even color. Pork luncheon meat was ground, cubed, sliced. Rice, macaroni, spaghetti, vegetables or even ground vienna or pork sausage were added to it. It was baked, creamed, fried, braised, made into patties, meat balls, meat loaf and cutlets.

In other words, one thousand and one ways were used to camouflage it. When working with items of this type the cook is at a disadvantage because the one thing that usually makes or breaks a dish is the spicing that is added. In working with canned meats of this kind ample spicing is already present.

All the recipes formulated were kitchen tested in 100 quantity servings and also tested for acceptability. It may be interesting to note that approximately 200 people a day were served

with only those items used overseas. Fresh vegetables, eggs, butter, milk and meat were non-existent in the Research Kitchen during the war. After four years the members of the Guinea Pig Club have eaten as much dehydrated and canned food as almost any overseas soldier. By using this method of quantity testing the same problems and the same difficulties were encountered and were taken into consideration when supplying information for preparation overseas.

The above examples were just a few of the problems. The limited number of ingredients available and the limited cooking equipment are stories in themselves all of which complicated the problem of food preparation and consequently that of food acceptance.

Everyone has heard repercussions regarding the acceptance of food overseas. There was endless griping about dried eggs, cartoons ridiculing hash and many stories about the horrors of dehydrated foods. In spite of all this if the proof of the pudding is in the eating, reports indicate that the troops ate enough of the right kind of food. Nutritional status surveys of the returning soldier indicate that he has been well fed and is in good physical condition.

INFLUENCE OF METHOD OF PREPARATION ON RETENTION OF PALATABILITY AND VITAMINS IN FOOD

by DR. FAITH FENTON, Cornell University, Ithaca, New York.

This paper will be confined to the retention of palatability and vitamins in vegetables for several reasons: They are one of the most poorly prepared groups of foods and they are more vulnerable than most foods. The methods of cooking, particularly the length of cooking, vary greatly from one section of the country to another; for example, in the North, green beans are cooked from 20 to 45 minutes, in the South, cooking them from four to eight hours is not unusual. People differ in the amount of water in which they prefer to cook the green and the so-called strong-juiced vegetables, and most of the research in this laboratory has been on vegetables; fresh, frozen, and dehydrated.

The objective in these studies was to determine just what factors in preparation resulted in losses of palatability and of vitamins, with the aim of omitting these factors or at least keeping them to a minimum.

The score card for judging palatability is given in Table I. The scoring which was blind was done by experienced judges from the Food and Nutrition, and the Institution Management staffs. Each judging panel consisted of from five to 10 persons. The vegetables were judged at 11:00 to 11:30 a. m., or from 4:00 to 4:30 p. m., when some time had elapsed since the last meal. The vegetable was swallowed by each judge and a drink of water was taken between each two samples.

TABLE I
Judging Record For Vegetables

Vegetable -----

Date -----

How do you like your vegetable cooked? Please check.

1. Rather raw-----

2. Firm but tender-----

3. Thoroughly done-----

Color

Surface Appearance

Texture

Flavor

Odor

Natural

Natural

Chewy

Natural

Unnatural

Shriveled

Firm

Off

Dark

Dry

Crisp

Weak

Light

Plump

Natural

Strong

Dull

Soggy

Mushy

Sweet

Natural Color

Tender

Sour

More Intense

Tough

Bitter

Soggy

Concen-

trated

Comments:

TABLE I (Continued)

Rating

	Appearance	Texture	Flavor	Total
5 Very good-----				
4 Good-----				
3 Fair-----				
2 Poor-----				
1 Very poor-----				

Signed-----

Each judge was requested to check how she preferred her vegetable; rather raw, firm but tender, or thoroughly done. Descriptive adjectives were given for each factor, of color, surface appearance, texture, flavor and odor so that all the judge was required to do was to check the descriptive term she chose. The lower part of the score card, labeled rating, served as a check on the score of each judge.

Retentions during the cooking of one fresh vegetable, one canned vegetable and one unsulfited dehydrated vegetable will be discussed. The effect of holding the last three warm for serving will also be reported. The effect of holding mashed and baked or scalloped unsulfited dehydrated potato shreds warm for serving will be included.

The palatability retention in cabbage cut in three ways and cooked in a steam-jacketed kettle and in a steamer ranged from 66 to 96 percent; the ascorbic acid retention ranged from 56 to 85 percent; the thiamin from 61 to 92 percent; and the riboflavin from 66 to 104 percent. The cabbage cut in wedges and cooked in the steamer with no water added retained the highest percentage of each of these water-soluble vitamins and at the same time was one of the most palatable products. In most cases the cabbage steamed with no added water scored as high in palatability as that cooked in water even though cabbage is a so-called strong-juiced vegetable. As was pointed out over a decade ago, by Halliday, vegetables belonging to the cabbage family are not strong-juiced until we make them so by over-cooking. The short cooking times, from four to ten minutes used in this study no doubt explain why the cabbage retained its sweet flavor even though

it was steamed with no water added. The steamer was of the free-venting type which carried off the volatile acids and acid-forming substances.

TABLE II
Effect of Preparation Methods of Fresh Cabbage
on Palatability and Vitamin Retention

Cutting	Cooking			Retention in Drained Cabbage			
	Method	Proportion of vegetable to water	Time min.	Palata-		Ascor-	Thia-
				bility	min	bic	flavin
Shreds ¹	Steam-jacketed kettle	3:1	4	93	57	64	66
	Steamer	0	4	93	72	77	91
Slices ¹	Steam-jacketed kettle	2:1	7	96	56	61	72
	Steamer	0	9	66	84	85	82
Wedges ²	Steam-jacketed kettle	1:6	7 - 8	80	74	85	90
	Steamer	0	10	87	85	92	104

¹ 10 pounds² 5 pounds

The palatability of canned peas when prepared for serving ranged from 69 to 83 percent, Table III. Steaming the peas in their own liquor, that contained about one-third of each of the water-soluble vitamins, resulted in the highest palatability score and in the second highest retention of ascorbic acid. Steaming the peas in the sealed No. 10 cans resulted in the second highest palatability score and in the highest retention of ascorbic acid, but in the

lowest retention of each of the B vitamins. The high percentage retention of ascorbic acid was probably because of the presence of little, if any, oxygen in the can; the low retention of the B vitamins was probably owing to the destructive effect of the higher temperature reached in the sealed cans with pressure built

up. An analysis of the liquor showed little total destruction of ascorbic acid but some destruction of the thiamin, riboflavin and niacin. This method of heating was not practical, however, because of the difficulty in opening the hot can.

TABLE III
Effect of Preparation Methods on Palatability
and Vitamin Retention in Canned Peas

Method	Heating		Retention in Drained Peas				
	Proportion of time vegetable to liquid	min.	Palata-bility	Ascorbic Acid	Thia-min	Ribo-flavin	Niacin
			Percent	Percent	Percent	Percent	Percent
Top of stove, ¹ Simmered	Liquid evaporated one-half (90 min.) before adding peas	4	69	33	70	76	87
Top of stove ¹ to 208°F.	Per se	68	69	35	62	66	63
In unopened #10 can in steamer	Per se	30	79	46	56	62	44
Uncovered ¹ in dishpan in steamer	Per se	15	83	44	61	68	59

¹ 100 servings (5 #10 cans)

Evaporating the liquor to one-half its volume before adding the peas resulted in one of the lower palatability scores and in the lowest ascorbic acid retention, but in the highest retention of each of the B vitamins. During the long heating, 90 minutes, of the liquor, ascorbic acid was gradually lost.

The palatability score of the prepared dehydrated unsulfited cabbage ranged from 60 to 80 percent; the vitamin retention ranged from 6 to 26 percent for ascorbic acid, from 42 to 76 percent for thiamin; from 58 to 76 percent for riboflavin and from 23 to 68 percent for niacin, Table IV. The cabbage prepared as cold slaw

received a higher palatability score than did cabbage cooked on top of the stove started in either cold or boiling water, or cabbage boiled in the steam-jacket kettle. It also retained the highest percentage of ascorbic acid, the most important vitamin in cabbage. Cabbage started in the smallest amount of boiling water and cooked a short time about 14 minutes, received the highest palatability score, next to the highest retention of ascorbic acid and the highest retention of each of the B vitamins. A direct relationship existed between the proportion of cooking water to cabbage, and the vitamin retention in each of the cooking methods.

TABLE IV

**Effect of Preparation Methods¹ on Palatability and
Vitamin Retention in Dehydrated Unsulfited Cabbage**

Cooking			Retention				
Method	Time	Proportion of vegetable to water	Palatability	Ascorbic Acid	Thiamin	Riboflavin	Niacin
	min.		Percent	Percent	Percent	Percent	Percent
Boiled on top of stove:							
A. Brought to boil ²	45	1:20.5		-			
Simmered	30		60	6	42	61	23
B. Added to boiling water		1:9.5					
Returned to boil		1½					
Simmered	12½		67	17	76	76	68
Boiled in steam-jacketed kettle							
Added to boiling water		1:16.1					
Simmered	10						
Cold Slaw							
Rehydrated at 72°F.	30	1:16.1	61	14	58	74	41
Marinated	30		80	26	52	58	24

¹ 50 servings.

² Put in cold water.

The palatability scores of sulfited dehydrated cabbage ranged from 58 to 78 percent, Table V, only two points lower than the range for the unsulfited cabbage. The sulfited cabbage scored higher in color, it was a natural green; about the same in texture and lower in sulfite flavor than did the unsulfited cabbage. Again

the highest scorers were the cold slaw and the cabbage cooked by adding it directly to boiling water, one of the smallest proportions, and simmering it for a very short time, seven minutes. The range of ascorbic acid retention, 31 to 72 percent, was appreciably higher than that of the unsulfited cabbage, 6 to 26 percent.

TABLE V
**Effect of Preparation Methods on Palatability and
Vitamin Retention in Dehydrated Sulfited Cabbage¹**

Cooking		Retention in Drained Cabbage					
Method	Time	Proportion of vegetable to water	Palatability	Ascorbic Acid	Thiamin	Riboflavin	Niacin
	min.		Percent	Percent	Percent	Percent	Percent
Boiled on top of stove							
A. Rehydrated at 68°F.	20	1:9					
Brought to boil	40						
Simmered	15		58	48	33	83	76
B. Added to boiling water		1:10					
Simmered	7		76	54	51	55	65

TABLE V (Continued)

Cooking		Time min.	Retention in Drained Cabbage				
Method	Proportion of vegetable to water		Palatability	Ascorbic Acid	Thiamin	Riboflavin	Niacin
C. Added to mixture of boiling cooking water and water Simmered	1:10	7	71	61	58	58	64
Boiled in steam-jacketed kettle							
A. Added to boiling water Boiled	1:14	7	75	36	36	51	52
B. Added to boiling water ² Simmered	1:10	7	72	72	58	85	74
Cold Slaw							
A. Rehydrated at 32-35°F. Marinated	1:10	240	69	41	56	--	60
B. Rehydrated at 85-92°F. Marinated	1:16	30	78	31	46	--	45

¹ 50 servings² Different lot of cabbage

The thiamin retention, however, was in the sulfited cabbage, only 33 to 58, the riboflavin retention was greater, 51 to 85, and the niacin retention was somewhat higher, 45 to 76 percent. Sulfiting stabilized the ascorbic acid during processing as well as during cooking of the cabbage. The fact that sulfiting resulted in greater loss of thiamin during both processing and cooking is of minor importance because cabbage is a relatively poor source of thiamin but an excellent source of ascorbic acid.

Boiling the sulfited cabbage in the largest proportion of water, 1 to 14, resulted in one of the lowest retentions of each of the vitamins. Because of the sulfite flavor in this cabbage, cooking it in a large proportion of water

resulted in a higher palatability score. The sulfite flavor was thus diluted. Preparing the cabbage for cold slaw by rehydrating it in a large proportion of water, 1 to 16, also resulted in low retentions of the vitamins. Since sulfiting stabilized the ascorbic acid, this vitamin was as well or better retained during cooking of the cabbage as it was during the preparation of it as cold slaw.

Holding the canned peas warm for serving by continuing to simmer them in their own liquor resulted in a gradual loss of palatability and of ascorbic acid, Table VI. Evidently some of each of the B vitamins were readSORBED from the liquor in which the peas were immersed.

TABLE VI
Effect of Holding Canned Peas¹

Condition	Holding		Retention in Drained Peas				
	Tempera-ture °F.	Time min.	Palata-bility	Ascorbic Acid	Thiamin	Ribo-flavin	Niacin
Heated	---	---	69	35	62	66	63
Held	Simmered	30	63	32	64	69	64
Held	Simmered	180	47	27	72	81	88

¹ One hundred servings held in own liquor after being cooked on top of stove.

Ascorbic acid was gradually lost from the cooked, unsulfited dehydrated cabbage during holding. It was lost only to a slight extent, however, from the cold slaw held at room temperature, Table VII. The acid in the vinegar sauce may have stabilized it. Again some of each of the B vitamins was apparently adsorbed by the cabbage, from the cooking water in which it was held.

The cooked, sulfited cabbage retained its ascorbic acid very well, Table VII. The cold

slaw again lost none of this vitamin. Some of the thiamin, however, was lost. Some of the riboflavin and niacin were readSORBED.

The readSORPTION of some of each of the B vitamins of each of the vegetables during holding is borne out by analysis of the holding waters.

During holding of the cooked cabbage, both the unsulfited and the sulfited deteriorated in palatability; the cold slaw did not.

TABLE VII
Effect of Holding Cooked Dehydrated Cabbage
on the Palatability and Vitamin Retention¹

Cabbage	Treatment	Holding			Retention in Drained Cabbage						
		Method	Temper- ature	Time	Palata- bility	Ascorbic Acid	Thiamin	Ribo- flavin	Niacin		
Unsulfited	Boiled (Method 1) ³	Held	Institution type warmer	140	90	60	6	42	61	23	
			Institution type warmer	140	180	-- ²	5	50	81	28	
		Held	Institution type warmer	140	180	-- ²	4	49	74	35	
			Simmered	194	90	67	17	76	76	68	
	Boiled (Method 2) ⁴	Held	Simmered	194	90	-- ²	12	81	116	83	
			Simmered	194	180	-- ²	9	82	100	82	
	Cold Slaw	Held	Cold Slaw	Room temper- ature	72	90	80	26	52	58	24
			Held	Room temper- ature	72	90	-- ²	24	45	62	21
		Held	Cold Slaw	Room temper- ature	72	180	-- ²	21	48	67	24
			Cold Slaw	Refrigerator	32-35	90	58	48	33	83	76
Sulfited	Boiled (Method 1)	Held	Boiled (Method 1)	Institution type warmer	140	90	--	47	31	79	80
			Boiled (Method 1)	Institution type warmer	140	90	75	36	36	51	52
	Boiled (Method 2)	Held	Boiled (Method 2)	Institution type warmer	194	60	37	35	29	57	65
			Boiled (Method 2)	Institution type warmer	194	60	7	31	46	--	45
	Cold Slaw ²	Held	Cold Slaw ²	Room temper- ature	72	90	85	30	52	--	43
			Cold Slaw ²	Room temper- ature	72	90	78	31	58	--	46
	Cold Slaw	Held	Cold Slaw	Refrigerator	32-35	90	87	33	55	--	47
			Cold Slaw	Refrigerator	32-35	90	87	33	55	--	47

¹ 50 Servings

² Cooked cabbage deteriorated; cold slaw did not

³ Method 1

⁴ Method 2

Ascorbic acid was lost quite rapidly during the holding of mashed unsulfited dehydrated potatoes that had been prepared by three methods. This loss occurred whether the potatoes were held in an institution type warmer or in a bain marie, Table VIII. The loss was no doubt caused by the presence of entrapped air. Ascorbic acid was lost only slightly from

the dehydrated potato shreds that had been baked in milk, and then held in the warmer. The B group of vitamins in the unsulfited dehydrated mashed potatoes suffered no loss during either holding method. A small loss of thiamin occurred in the baked potatoes during the 90 minute holding period.

TABLE VIII
Effect of Holding Mashed and Baked Unsulfited
Dehydrated Potato Shreds¹

Condition	Method	Holding			Retention				
		Temperature	Time	Palatability	Ascorbic Acid	Thiamin	Riboflavin	Niacin	
		°F.	Min.	Percent	Percent	Percent	Percent	Percent	Percent
Mashed (method 1)	Institution type warmer	140	90	45	44	104	83	95	
				--	13	105	88	116	
Held	Institution warmer	140	180	--	2	107	88	121	
Mashed (Method 2)	Bain Marie	160	90	61	51	104	95	122	
				--	10	102	95	108	
Mashed (method 3)	Institution warmer	140	90	67	32	104	124	106	
				--	13	109	124	107	
Baked with milk	Institution warmer	140	90	67	49	95	85	116	
				--	43	79	99	110	

¹ 50 servings.

² Undisturbed in baking pans.

SUMMARY

Methods of cooking which will result in the maximum retention of both palatability and vitamins are possible. Therefore, it is no longer necessary to discuss which is more important, as though methods for obtaining each were antagonistic. One of the largest determining factors in the retention of each of the water-soluble vitamins in the drained vegetable is the proportion of water to vegetable up to the point that the vegetable is immersed. Long cooking

and long holding of fresh, canned, and dehydrated vegetables results in a gradual loss of palatability and of ascorbic acid. Acid tomatoes are an exception. Sulfiting dehydrated vegetables stabilizes ascorbic acid but results in greater destruction of thiamin. It also stabilizes the green color in cabbage but there is danger of its giving a sulfite flavor to the vegetables.

A REGIONAL APPROACH TO FOOD HABITS AND ATTITUDE RESEARCH

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The assumption of this discussion is that the best basis for understanding regional food habits is to study the dishes which make up typical menus of families in the region. The menu is a good basis for understanding regional food habits because it gives a picture of dishes ordinarily served. Macaroni and cheese or macaroni with tomato sauce are more meaningful than just macaroni.

For example, one may not eat carrots in their natural state but he may eat carrot strips, carrot and raisin salad, or boiled carrots seasoned with butter or oleo. Apples may be consumed as baked apples, apple sauce, fried apples, apple salad, and other ways.

Foods are eaten in terms of a particular recipe. It is the name or the description of the recipe that concerns us. This name or description will be called a dish. Homemakers most frequently serve familiar dishes, or often-tried recipes to family members. However, sometimes they may try a new dish. This new dish may be of three general types:

1. A new combination of familiar foods. For example, if grapefruit had been used in the family as a breakfast fruit dish and the homemaker served it for the first time in the form of grapefruit salad, she would be serving her family a new combination of familiar foods, or one type of new dish.
2. A new method of preparing a familiar food. An example of this type of new dish would be steaming mustard greens when formerly they had been served boiled.
3. A new food. For instance, if the homemaker served buttered broccoli to her family and broccoli had never before

appeared on the family table in any form, buttered broccoli would be regarded as a new dish of this third type.

The menu is a good basis for understanding regional food habits not only because it gives a picture of dishes ordinarily served but also because dishes are eaten in combination with other dishes, in culturally determined clusters.

Here are two illustrations: The first is from a study made about two years ago of the effect of a white cornmeal shortage on the consumption of cornbread by groups of whites and Negroes, as well as the effect on the consumption of other dishes. (1)

During the summer and early fall of 1943, supplies of white cornmeal, the kind ordinarily used in making cornbread, were unobtainable or very limited in Mississippi. The study was based on data from 1,404 white and Negro children in 12 junior high schools. About 60 percent of the white children and 80 percent of the Negro children reported that their families had not been able to find white cornmeal on the market. Families of 12 percent of the white children and 8 percent of the Negro children not finding white cornmeal on the market served no cornbread at all; families of 44 percent of the white children and 62 percent of the Negro children made cornbread a few times, using yellow meal; and families of 44 percent of the white children and 30 percent of the Negro children made cornbread as usual, using yellow meal. Green vegetables, peas and beans and buttermilk were the foods eaten less often than usual during the cornmeal shortage.

As will be noted from Table I, in which dishes served most frequently by four groups of 160 white and Negro small-town families of Mississippi during one week in July or

August are listed, biscuit is a popular breakfast dish.¹ Biscuit is a bread made from flour, fat, salt, soda and/or baking powder, milk and/or water, or from a flour with salt and leavening agents added, fat, and milk and/or water. Biscuits were served once or more during the record week by from 75 to 100 percent of the families in every group. White families with \$20.01 to \$40.00 monthly housing value served biscuits on an average of 2.5 times during the report week; white families with \$20.00 and under housing value, 3.5 times; Negro families with \$7.50 and under housing value, 4.4 times;

and Negro families with \$7.51 to \$20.00 housing value, 4.3 times. Probably one factor contributing to the popularity of biscuit for breakfast is the popularity of cane sirup. In the cornmeal study referred to above, children were asked if there were any foods they would not eat at all if there were no biscuit. Cane sirup and gravy were the two foods most often mentioned. At the time these menus were kept, the supply of cane sirup was about exhausted. (The new supply comes in shortly before frost, about the

¹ Unpublished data taken from the Mississippi food preparation studies.

TABLE I

Dishes most frequently served at breakfast during one week in July or August in homes of 80 white town families with monthly housing values of \$20.00 and under and \$20.01 to \$40.00, and in homes of 80 Negro town families with monthly housing values of \$7.50 and under and \$7.51 to \$20.00, Mississippi, 1943.

Group	Foods served once or more by from 75-100 percent of the families	Foods served once or more by from 50-74 percent of the families	Foods served once or more by from 25-49 percent of the families	Foods served once or more by from 15-24 percent of the families				
41 white families housing \$20.00 and under	Toast Biscuit Coffee	3.2 3.5 6.2*	R. P. cereal B. bacon F. egg Jelly Butter	1.5 2.4 1.8 2.3 3.0	S. egg W. milk Cane sirup	1.3 1.7 1.3	P. cereal Cantaloupe Orange Juice Sausage Jam B. ham Gravy	.8 .4 .3 .3 .4 .4 .5
39 white families housing \$20.01 \$40.00	B. bacon Toast Biscuit Coffee	3.4 3.9 2.5 6.4	R. P. cereal S. egg F. egg Jelly Butter	2.8 2.1 1.8 2.3 3.1	W. milk Cane sirup Preserves	2.6 1.0 .7	Cantaloupe Orange Juice Oranges B. ham	.6 .3 .2 .3
39 Negro families housing \$7.51 and under	Biscuit	4.4	O. cereal Coffee Cane sirup Butter Gravy	1.5 2.5 2.1 2.0 2.5	R. P. cereal F. eggs B. bacon F. salt meat Sausage Toast W. milk Jelly	.7 1.7 .6 1.0 .6 1.2 .6 	F. chicken B. ham F. pork chops Cornbread S. eggs	.2 .3 .3 .2 .4
41 Negro families housing \$7.51 \$20.00	Biscuit	4.3	O. cereal F. eggs B. bacon Toast Coffee Jelly Butter	1.8 1.9 1.8 1.5 3.2 1.6 3.0	R. P. cereal S. eggs F. salt meat Sausage W. milk Cane sirup Gravy	1.0 .9 .5 .5 1.2 1.3 .3	F. chicken B. ham Cornbread	.2 .3 .5

*Average number times served per family per week. (Applies to all figures listed)

Note: Cornflakes was the most often served ready prepared cereal; oatmeal, prepared cereal and rice, other cereal by all groups. Grits was not as popular as rice. Rice and grits are served with gravy or butter. Milk is not used on these two cereals.

Abbreviations used in Table I

B. bacon = breakfast bacon	O = other
R. P. cereal = ready prepared	W = whole
F. = fried	B. ham = broiled ham
S. = scrambled	

last of October.) Jelly had been made in May and June by a number of homemakers from dewberries, blackberries, plums and grapes. Therefore, menus from these same families in November and December might show more biscuit and sirup, less toast and jelly.

Dishes are consumed, not in abstract, but under surroundings that vary with culture. The surroundings under which dishes are served are very important. A college instructor recently told me of lunch at a cafeteria in which the food was just fine until three flies lit, one on the rim of his milk glass and the other two on the salad. In describing this incident he said, "My stomach just turned over and I couldn't eat another bite." Dishes are more than food. They are more than preparation. They may mean clean linen, shining silver, separate plates for different courses, even

flowers on the table. They may mean eating with Emily Post table manners. Therefore, whatever the approach to food habits and attitudes, whether by means of particular foods, or by menus served, there is need to consider the surroundings under which the dishes will be consumed.

The assumption that the menu is the best basis for understanding regional food habits has another good basis. Menus served are dishes families eat. Families like what they eat. Their likes are the result of food availability, climate, geographical conditions, and technological development.

A number of illustrations of food likes resulting from culture taken from food preparation studies, are shown in Tables I, II and III, but first note the fact that even low socio-economic status families have a wide range of choice of

TABLE II

Dishes most frequently served at dinner during one week in July or August in homes of 80 white town families with monthly housing values of \$20.00 and under and \$20.01 to \$40.00, and in homes of 80 Negro town families with monthly housing values of \$7.50 and under and \$7.51 to \$20.00, Mississippi, 1943.

Group	Foods served once or more by from 75-100 percent of the families	Foods served once or more by from 50-74 percent of the families	Foods served once or more by from 25-49 percent of the families	Foods served once or more by from 15-24 percent of the families				
41 white families housing \$20.00 and under	B. lima beans B. cowpeas I. pot. (AM) Tomatoes (Sl) Cornbread Iced tea	2.1 1.7 2.1 3.4 4.8 3.8	* Corn (AM) Okra (AM) B. string beans Biscuit	1.5 .9 .8 1.1	Beefsteak (AM) F. chicken B. ham Veg. soup B. rice Slaw (AM) Cakes (AK) Cookies (AK) Ice cream (AK) Peaches White bread W. milk B. milk Gravy Sandwiches (AK)	.5 .4 .3 .4 .6 .4 .6 .5 .7 .3 .5 1.0 1.5 1.2 .4	Beef roast (AM) Eng. peas (canned) Onions (AM) Sl. green pepper Macaroni & cheese Potato salad Tomato salad Apple pie Apple sauce Peach pie White rolls Butter	.2 .2 .3 .2 .2 .2 .2 .3 .2 .2 .5 .3

TABLE II (Continued)

Group	Foods served once or more by from 75-100 percent of the families		Foods served once or more by from 50-74 percent of the families		Foods served once or more by from 25-49 percent of the families		Foods served once or more by from 15-24 percent of the families	
39 white families housing \$20.01- \$40.00	B. lima beans I. pot. (AM) Tomatoes (Sl) Cornbread Iced tea	2.3 2.2 3.8 4.1 4.1	F. chicken Corn (AM) B. cowpeas Okra (AM) Ice cream (AK) Biscuit Gravy	.9 1.5 1.2 1.6 1.1 1.8 1.8	B. ham B. str. beans B. rice Potato salad Apple pie Cakes (AK) Cookies (AK) Peaches White bread White rolls W. milk B. milk	.3 .7 .7 .4 .5 .6 .6 .4 .8 .5 .8 .9	Sandwiches (AK) .3 Beef hash .2 Beef roast (AM) .3 Beefsteak (AM) .3 Carrots (AM) .2 Eng. peas (canned) .3 Onions (AM) .2 Sl. green peper .2 Squash (AM) .2 Veg. soup .2 Comb. veg. salad .2 Slaw (AM) .2 Lemon pie .2 Watermelon .2 Butter .5	
39 Negro families housing \$7.50 and under	B. cowpeas Cornbread	1.6 5.4	B. lima beans Cabbage (AM) Corn (AM) I. pot. (AM) Tomato (Sl) Iced tea Biscuit	1.0 .8 .9 1.1 1.3 1.3 .8	F. chicken Okra (AM) B. str. beans B. turnip greens B. rice Apple pie White bread Lemonade B. milk Gravy	.3 .7 .4 .3 .5 .4 .3 .3 .6 1.0	Beef stew .2 Pork ribs .2 F. salt meat .3 Sausage .3 B. collards .2 Eng. peas (canned) .2 Veg. soup .3 Spag. & tomato .2 Potato salad .2 Cake (AK) .3 Cookies (AK) .2 Peach pie .3 W. milk .2	
41 Negro families housing \$7.51- \$20.00	B. cowpeas I. pot. (AM) Cornbread	1.7 1.7 5.7	B. lima beans Cabbage (AM) Corn (AM) Okra (AM) Tomatoes (Sl) Iced tea Biscuit	1.0 .7 1.2 1.3 1.5 1.5 .9	F. chicken B. str. beans B. rice Apple pie Cakes (AK) W. milk B. milk Gravy	.5 .4 .5 .6 .4 .5 .9 .9	Beef stew .2 F. pork chops .3 Pork ribs .2 B. collards .2 Eng. peas (canned) .2 B. turnip greens .2 Veg. soup .2 Spag. & tomato .3 Potato salad .2 Bread pudding .2 Cookies (AK) .2 Egg pie .2 Ice cream (AK) .2 White bread .2 White rolls .2 Lemonade .2 Butter .2	

*Average number times served per family during week. (Applies to all figures listed)

Note: All fruits and vegetables are fresh unless stated otherwise.

Abbreviations:

B == boiled when referring to vegetables and rice;
broiled when referring to meat

AM = all methods

Sl = sliced

F = fried

AK = all kinds

W = whole

B = butter, when referring to milk

TABLE III

Dishes most frequently served at supper during one week in July or August in homes of 80 white town families with monthly housing values of \$20.00 and under and \$20.01 to \$40.00, and in homes of 80 Negro town families with monthly housing values of \$7.50 and under and \$7.51 to \$20.00, Mississippi, 1943.

Group	Foods served once or more by from 75-100 percent of the families	Foods served once or more by from 50-74 percent of the families	Foods served once or more by from 25-49 percent of the families	Foods served once or more by from 15-24 percent of the families		
41 white families housing \$20.00 and under	B. lima beans Tomato (Sl) Cornbread Milk (AK)	1.7 3.1 4.1 3.2	Corn (AM) B. cowpeas I. pot. (AM) Iced tea	1.3 1.6 1.2 2.6	Chicken (AM) .7 Ham (AM) .4 Okra (AM) .7 B. str. beans .8 Sandwiches (AK) 1.5 Tomato sand. .6 Cake (AK) .4 Ice Cream (AK) .5 Pie (AK) .6 Biscuit .6 White bread .4 Butter .6	Beefsteak (AM) .2 Eggs (AM) .2 Veg. soup .3 B. rice .2 Mac. & cheese .2 Potato salad .2 Slaw .3 Cantaloupe .2 Cookies (AK) .3 Peaches .2 Puddings (AK) .2 White rolls .5
39 white families housing \$20.00 \$40.00	Milk (AK)	3.7	Chicken (AM) .9 B. lima beans 1.4 B. cowpeas .9 I. pot. (AM) 1.3 Tomato (Sl) 2.7 Sandwiches (AK) 2.7 Pies (AK) 1.0 Cornbread 2.3 Iced tea 1.8	Eggs (AM) .5 Corn (AM) .9 Okra (AM) .9 B. str. beans .4 Tomato sand. 1.1 Cake (AK) .5 Cookies (AK) .4 Ice cream (AK) 1.0 Biscuit .6 White bread 1.0 Butter .6	Ham (AM) .3 Cheese sandwich .2 Peaches .2 Watermelon .2 White rolls .4 Jelly .4	
39 Negro families housing \$7.50 and under			Cornbread 2.6 Biscuit 1.5	B. lima beans .5 I. pot. (AM) .6 B. rice .5 Sandwiches (AK) .7 Pies (AK) .5 Iced tea .6 Milk (AK) .9 Cane sirup .5 Butter .4	Chicken (AM) .2 B. bacon .2 F. salt pork .3 F. pork chops .2 Sausage .2 Cabbage (AM) .2 Corn (AM) .4 B. cowpeas .5 Okra (AM) .3 B. str. beans .2 Tomatoes (Sl) .2 Tomato Sand. .3 Watermelon .2 White bread .2	

TABLE III (Continued)

Group	Foods served once or more by from 75-100 percent of the families		Foods served once or more by from 50-74 percent of the families		Foods served once or more by from 25-49 percent of the families		Foods served once or more by from 15-24 percent of the families	
41 Negro families housing \$7.51-\$20.00	Cornbread	3.3	Biscuit Milk (AK)	1.1 1.7	Chicken (AM) B. lima beans Corn B. cowpeas I. potatoes B. rice Sandwiches Tomato sand. Iced tea Butter	.5 .4 .4 .9 .7 .4 1.5 .6 .6 .6	Beef stew F. salt pork Sausage B. str. beans Cabbage (AM) Okra (AM) Tomato (Sl) Cookies (AK) Watermelon White bread Cane sirup Jelly Lemonade	.2 .2 .3 .2 .3 .4 .2 .3 .2 .2 .2 .2

*Average number times served per family during week. (Applies to all figures listed)

Note: All fruits and vegetables are fresh unless otherwise stated.

Abbreviations:

B = boiled when referring to vegetables and rice
 AM = all methods
 Sl = sliced

F = fried
 AK = all kinds

dishes. The 39 Negro families with housing value of \$7.50 monthly and under, for example, served 25 different meat dishes during the report week, but some of these dishes were much more important than were others.

Only five percent of the new dishes tried during the report year by 1,158 small-town families of Mississippi received fair or poor family reaction.(2) In other words, dishes that family members do not like do not get to the table, nor are new dishes tried unless the home-maker is fairly sure the family will like the new dish.

Food attitudes are the result of food habits and food habits are the result of food availability, climate and technological development. As has been already pointed out, biscuit formed a rather prominent breakfast food of Mississippi town families. Male heads and home-makers, the majority of whom were reared on Mississippi farms, had had biscuit for breakfast when they were children. Making yeast bread has never become established in the South as in other regions, since a warm moist climate causes bread to mold quickly.

Farm-reared people are using an increasing amount of bakery bread, available at low cost. Making yeast bread is almost altogether limited to dinner rolls of various kinds, and to families of higher socio-economic status. Homemade rolls are generally considered as a special bread, special for company dinners, holiday or Sunday dinners. In listing rolls in menus in Tables I, II, and III, grouped together are bakery and homemade rolls. Most of the rolls used by families in which records were kept were bakery rolls and these cannot be considered in the class with homemade rolls.

As will be noted in Table II, cowpeas and butter beans (a small green lima) were used by a large proportion of families in all four groups. These two vegetables are good producers and because they are good producers they are generally available, are eaten, and liked. The fresh peas and beans are considered even more palatable than dried ones; therefore, they are put in cold storage lockers in large quantities by those having lockers. The usual method of cooking these legumes is to boil them using salt pork, or drippings from bacon or salt pork, or

lard as seasoning. Butter beans, however, are seasoned with butter or margarine by a number of homemakers. This is rarely true in the case of cowpeas.

The use of pork fat in seasoning vegetables is a recipe that has been passed down from mother to daughter. Milk and butter were formerly scarce because of the difficulty in keeping them sweet in hot weather and for other reasons. Salt pork, cured pork, and lard had good keeping qualities, were always available, and, therefore, were used for seasoning.

Families of this study ate large amounts of Irish potatoes, very little of sweet potatoes. This was because Irish potatoes were in season. Sweet potatoes mature in autumn and were not available or were available in small quantities only during the study period. Because Irish potatoes mature in hot weather and generally receive poor handling and storage, their season is short. Sweet potatoes mature in the autumn and are easier to keep under southern conditions. They are, therefore, more available and are more often consumed.

Iced tea is the traditional dinner and supper drink in summer. Iced coffee is rarely or almost never used. Many families serve iced tea who never serve hot tea. The iced tea served is generally weak, while coffee is likely to be fairly strong. Just why drinking iced tea in summer has become a traditional food habit in the South, I do not know. Many families who have no means of refrigeration often buy five or 10 cents worth of ice for tea. Real Southerners like their tea chock full of ice.

The most important dinner meat used was fried chicken (Table II). Fried chicken is a traditional summer meat dish of Southern rural-reared people, since chicken can easily be produced and can be killed shortly before cooking. Since pork is produced in quantity, lard is readily available for frying. Then, too, frying-sized chicken is ordinarily in season at a time when fresh pork is not available.

Green peas are referred to in the South as English peas, not as peas, as in other regions. Peas in the South mean cowpeas. Canned English peas are generally preferred to the

fresh peas by Mississippi people. English peas are difficult to produce and, therefore, are not as generally eaten. Canned English peas may be found in large amounts in all groceries. Shipped-in fresh peas are available, but are not so sweet and are expensive. Canned asparagus and canned pineapple also are generally preferred to fresh for the same reason.

Technological development is bringing about many changes in food habits. The typical supper of rural-reared Southerners has always been left-overs from dinner. As will be noted in Table III, sandwiches were served at supper by from 25 to 49 percent of the families in all groups except one, white families of \$20.01 to \$40.00 housing value. From 50 to 74 percent of the families in this group served sandwiches once or more during the schedule week at supper. The establishment of this food habit no doubt awaited availability, in conveniently located grocery stores, of salad dressings, mayonnaise, and baker's bread of good quality at low selling price.

As has been indicated, there were many similarities in dishes served by white and Negro families of the two housing value groups and in frequency of dishes served. In Table IV is shown the number of dishes served, disregarding repetitions. As will be noted, Negroes served considerably fewer dishes than whites. Some of the differences in number of dishes served by the white and Negro groups can be accounted for by the practice by certain Negro families of serving only two meals. The meal omitted was usually supper, though sometimes it was breakfast.

Differences as well as similarities in dishes served are found among groups within the region. Typical menus are not the same for all groups. Difference in economic status, and in cultural background, cause many of these differences. Families in a community with electricity and mechanical refrigeration would not serve the same type of dishes as those in a community depending on lowering food into wells for refrigeration.

A few of the differences in dishes served by the four groups listed in Tables I, II and III

TABLE IV

Average number of dishes served during one week in July or August by white town families of \$20.00 and under housing and of \$20.01 to \$40.00 housing, and by Negro town families of \$7.50 and under housing and of \$7.51 to \$20.00 housing, Mississippi, 1943.

Meal	White families housing \$20.00 and under* (41 families)	White families housing \$20.01 to \$40.00 (39 families)	Negro families housing \$7.50 and under (39 families)	Negro families housing \$7.51 to \$20.00 (41 families)
	Number of dishes	Number of dishes	Number of dishes	Number of dishes
Breakfast	34.0	37.6	23.6	28.1
Dinner	41.6	41.7	27.3	30.0
Supper**	35.2	34.8	16.5	19.3
Total	110.8	114.1	67.4	77.4

*Only three of the 41 white families had housing values of \$7.50 and under. Housing values of whites and Negroes are not comparable, for to get the same kind of house the Negro usually has to pay somewhat more.

**Includes a few serving lunch instead of supper.

may be pointed out briefly. From 75 to 100 percent of the white families in the \$20.01 to \$40.00 housing value group served bacon once or more for breakfast, while only 50 to 74 percent of the white families in the \$20.00 and under housing value group served it that often. From 50 to 74 percent of the Negro families in the \$7.51 to \$20.00 housing value group served milk for supper once or more, while only 25 to 49 percent of the Negro families in the \$7.50 and under housing value group served it as often.

Turnip greens, collards, and cabbage are spring, fall, and winter vegetables, but were evidently so well liked by Negro families that they were also eaten in summer in fairly large quantities in spite of the fact that they were not at the best eating stage. Because these vegetables are cheap and easily grown, they are eaten in large amounts by low income southern people and especially by Negroes, since most Negro families are in low income groups. People like what they eat.

One example of technological changes causing differences in dishes served is in the use of ice cream. Those families most frequently having a mechanical refrigerator most often served ice cream. Fifty-five of the 80 white families keeping menus and 8 of the 80 Negro families keeping menus had mechanical refrigerators.

As has been said, a study of dishes making up typical menus of families in a region is a good basis for understanding food habits, because the menu gives a picture of dishes served, because we eat dishes in combination with other dishes, and because it represents what families like. Families eat what they like. This is called the menu approach.

The schedules in general use for collecting data on dishes served at the different meals are not adequate, since they disregard methods of food preparation and/or forms in which served. Research is very much needed here.

In this discussion of food habits, there is one more point that might well be considered. That is the factors affecting changes in food habits. It was clearly shown in the Mississippi food preparation studies that the most acceptable new dishes is the smallest modification of what is familiar.(2) Need for a list of familiar dishes, especially in feeding large groups with differing background, is thus indicated.

If it is necessary to introduce a new food, then it will be more acceptable to introduce it by itself. In other words, if summer squash had not been served before, it would be more acceptable boiled until tender and seasoned with salt pork or bacon drippings; *i.e.*, a familiar seasoning. It would be unwise, for instance, to serve beets for the first time with string beans, hard

cooked eggs and French dressing arranged on lettuce leaves. There seem to be a few exceptions to the rule that mixtures are to be avoided. For instance, new leafy vegetables, such as Swiss chard, spinach, beet tops and kale were favorably received if mixed and cooked with turnip greens, a known and well liked green. If this same principle applies to mixtures with spinach in the case of the Northern students, perhaps one less complaint would have been registered at the Mississippi State College Cafeteria. A Northern boy taking aviation training reported to one of the assistants at the cafeteria that "I don't like to complain, but there is something wrong with the spinach." The dish was not spinach, but turnip greens. Perhaps there would have been no complaint had spinach been added to the turnip greens and the dish been seasoned with margarine and garnished with a few hard cooked eggs.

In the Mississippi food preparation studies, influence of friends was found to be the most important means of getting homemakers act-

ually to try out new dishes. The source of suggestion for about 30 percent of the new dishes tried was a friend.(2) Friends may not be so important in a different type of society, such as the Army, for example.

A factor which tends to slow up change in food habits, especially in lower socioeconomic levels, is the influence of traditional food preparation rules, or rules passed down from mother to daughter. For example, in a study of traditional food preparation rules made in Mississippi, 52 percent of the 698 white homemakers and 84 percent of the 460 Negro homemakers reported one or more rules in food preparation taught them by mother or someone else in the parental home.(3) Table V gives a classification of these rules by source and Table VI the classification used in the report. As will be noted, it was not possible to classify the majority of rules by source, since the source of many could not be determined.

In the preparation of food by military personnel for military personnel, traditional food

TABLE V

Food preparation rules taught by mother or someone else in parental home reported by older and younger white and Negro homemakers classified by source (1,158 Mississippi town homemakers, 1943)**

Item	White homemakers		Negro homemakers	
	Over 40 years	40 years and under	Over 40 years	40 years and under
	Percent	Percent	Percent	Percent
Scientific rules (those recommended by modern nutrition or food specialists)	57	63	24	36
Written tradition (out-of-date, found in old cookbooks)	37	31	37*	29*
Oral tradition (rules accompanied with reasons which imply unwholesome qualities exist in food)	6	6	39	35
Number of rules in 3 groups above	175	138	138	159
Number of rules reported in all	464	317	348	370

*Thirty-three of these rules reported by women over 40 years and 31 by women 40 years and under were "add vinegar to tender" rules.

**Traditional Food Preparation Rules, Dorothy Dickins, Miss. Agri. Exp. Sta. Bull. 418, pp. 11.

TABLE VI
Classification of Food Preparation Rules Taught White and Negro Homemakers*

Item	Reported by:			
	White women		Negro women	
	Over 40 years	40 years and under	Over 40 years	40 years and under
Preparation rules:	Percent	Percent	Percent	Percent
(1) In accord with practices now recommended	21.6	27.4	9.2	16.0
(a) By nutrition specialists (nutrition recommendations)	9.5	17.0	6.3	10.0
(b) By food specialists (technical recommendations)	12.1	10.4	2.9	6.0
(2) In accord with directions found in old cookbooks examined; now outdated	14.0	13.6	15.0	12.3
(a) Because of increased knowledge of nutrition	6.3	5.7	2.9	2.4
(b) Because of better technical methods developed by food specialists or changes in processing	7.7	7.9	12.1	9.9
(3) In accord with observations but not found in old cookbooks examined; now outdated	9.9	6.7	18.1	17.9
(a) Because of increased knowledge of nutrition	5.8	5.4	16.4	17.9
(b) Because of better technical methods developed by food specialists or changes in processing	4.1	1.3	1.7	0
(4) Seeming to have but little or no basis	49.8	49.1	49.4	46.2
(5) Of the recipe type	4.7	3.2	8.3	7.6
Total	100.0	100.0	100.0	100.0
Number of rules	464	317	348	370

*Traditional Food Preparation Rules, Dorothy Dickins, Miss. Agri. Exp. Sta. Bull. 415, p. 15.

preparation rules may be more important than written instructions. Cooks in Army kitchens are human beings from all regions, many of whom knew something about cookery before they entered the Army. Just how important, for instance, are manuals of instruction in vegetable cookery where great latitude of procedure is possible? Repeated casual informal contact ranging from buck privates to graduate chemists with Army kitchen experience gives the impression that this is an important problem. Perhaps a problem for consideration by this conference group.

SUMMARY

The best basis for understanding regional food habits is by studying menus used by typical families in the region, is the assumption of this paper. The bases for this assumption are: Menus are records of dishes served, food in raw material is rarely eaten. Dishes are eaten in combination with other dishes, in culturally determined clusters. Menus represent what family members like, for family members like what they eat. Food attitudes are the result of habits and food habits are the result of food availability, climate, geographical conditions, technological development.

Two other considerations in the study of regional food habits are surroundings under

which dishes are consumed and factors affecting change.

Dishes are consumed, not in abstract, but under surroundings that vary with culture. The surroundings under which dishes are eaten are important.

The new dishes most readily accepted by families included in Mississippi food preparation studies were those with smallest modification of the familiar. Ways of getting better acceptance of new dishes involving use of a food not before served the family suggested by this study were:

1. That mixtures be avoided.
2. That familiar seasonings be used.
3. More effective use of local leaders, since friends were

the most important source for suggesting new dishes actually tried.

An important factor in retarding change in dishes served was the stabilizing influence, particularly at lower socio-economic levels, of cultural traditional food preparation rules. It was suggested that in preparation of dishes by military personnel for military personnel, traditional cultural rules may be more important than written instructions.

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THIRD SESSION

SAMPLING POPULATIONS FOR FOOD HABITS STUDIES

Thursday, 6 December, 1945

CHAIRMAN
MAJOR GEORGE GELMAN,
TECHNICAL DIRECTOR.

*Quartermaster Food and Container Institute
For The Armed Forces*

CERTAIN ASPECTS OF SAMPLING PUBLIC OPINION

by DR. ELMO ROPER,
30 Rockefeller Plaza, New York, New York.

Those who are engaged in sampling public opinion are not operating in the field of an old and settled science. Several sampling methods are used by Elmo Roper but the so-called "quota" method is most commonly associated with his work because it is used more for more clients than is any other one method of drawing samples.

It is agreed at the outset that there is no single right way of sampling which can be applied straight across the boards. Too many considerations are involved such as the nature of the problem, the degree of accuracy desired, the amount of money available for research, all of which must be considered when deciding upon the sampling method to be used. One speaker here has been working intensively with all methods of sampling and making a considerable contribution to the science. Another speaker will discuss stratified sampling so perhaps it will be best for this talk to outline the general principles of quota sampling, but bear in mind that the quota method is not considered suitable for use at all times, for all problems.

When the problem has been stated, the right method of sampling has to be selected, taking into consideration such factors as money available and the desired degree of accuracy. The first problem is to select and then interview a limited number of individuals who represent a microcosm of the universe. If the results of the survey are to be used in a story on baby food, probably all unmarried men over the age of 60 should be left out of the sampling.

There is nothing new about sampling, according to a man in Louisville who is a student of Chinese literature. He cites certain passages in a book, whose author was a contemporary of Confucius, which record the use of a kind of opinion sampling in that dim area of the past.

So perhaps it isn't a new idea to try to find certain principles to use in determining, from interviewing a small segment of the population, what the whole population is doing, has done, and intends to do. In trying to make that selection certain factors which influence the way in which people think and act must be kept in mind. For example, those living in different parts of the country have different reactions, different ways of thinking about different kinds of things. The geographic area in which people live influences the ways they think and act, and the size of the community in which they live also makes a difference. A survey on the prohibition question reveals that acceptability of prohibition rises as the size of place decreases. Age is another factor which influences the way people think, particularly on a political subject. The older person is more conservative, and becomes increasingly conservative as he grows older. Sex also makes a difference. The two sexes are often primarily interested in different things and so there is a difference in the answers given by men and women. Many women answer questions with "I don't know", particularly sociological or political questions. Men usually give a more definite answer.

Another great influence is evident in different economic levels. For the definition of that factor there are as many formulae as there are experts to disagree on them! Certain experts say that economic level should be based on dollar income received; others argue it is best defined by the value of the home, if it is owned, or the rental value, if it is rented. Early in this business of sampling public opinion, one false assumption was made: people who had a servant were in the higher economic levels! A single example will prove the fallacy in that theory. In the South a great many people had low paid servants but they were not thus neces-

sarily in the higher economic level. Using money as the sole factor is unsound practice. A bachelor living in Dubuque, Iowa, with an income of \$4,000 a year is in a higher economic level than a man in New York City who is married, has five children of school age, and earns the same \$4,000 a year. An effort has been made to evolve a better method of determining economic levels, one which recognizes the difference in living costs from one size of a community to another, and the number of dependents and other obligations of each head of a family. This sometimes results in what seems to be a curious anomaly. For example, a banker in a county in Iowa, having \$100,000 capital and a total income of \$7,000 yearly, would be put in the top economic level along with Henry Ford, the Vanderbilts and the Astors, because this banker would be at the economic top of his community. Politically he would probably think much along the same lines as a big city millionaire.

A person who takes the comforts of life for granted and can have the luxuries that are common to the well-to-do in his community would be rated at the top of the economic ladder. In the upper middle class would be the families who take the necessities and comforts of life for granted but have to go without certain luxuries in order to have others. For example, to keep a servant they may give up expensive vacations. The lower middle class would be those persons who have the comforts and necessities of life as long as their reasonably secure jobs last but they must save up for the simple luxuries. In the poor economic level would be the people who have necessities of life as long as their not-very-secure jobs last but are compelled to save up for even the major necessity expenditures, such as the winter coal bill or new outfitting for the children of school age. At the bottom of the economic scale are the people not even on relief. This type of sliding scale may be difficult to defend but it is more realistic than the dollar income method.

Occupation sometimes makes a difference, not so much in influencing opinion as in influencing habits. Other important factors might be included in any study of food habits. Education has tremendous effect on the way people eat and

on their attitudes toward food. Religious taboos affect food habits also, and there are many other factors which ought to be taken into account in any study of food habits and attitudes.

The quota system is only one method of sampling and it is reasonably accurate. It has faults which are often difficult to overcome but other systems have the same or different faults, equally difficult to overcome. Many methods of sampling consistently under-represent the undereducated. For some reason the person who answers the doorbell is often the brightest and best educated member of the family! Also consistently under-represented are the older people, who are also less well educated in general. One difficulty is that the older people are protected from interviewers. Other family members will not let grandma come downstairs to talk! If the sample is broken down by ages into five-year groups, it is important to interview the proper number in the top age group and they are the ones who are often not allowed to be interviewed. When the desired number in the top age group can be interviewed they are seldom typical. If only the healthier, stronger and better educated older persons are included, the sample will be out of balance.

Another factor in quota sampling presents difficulties. Only the people of all ages who are willing to talk can be interviewed. Persistent and well directed sales effort will get more interviews and thus overcome this difficulty in part.

But with all of its faults the quota system is not quite as elastic or inaccurate as using a rubber band for a measuring stick! It is possible to approximate rather closely what people think. The more money there is available, the closer the approximation; the more time there is available, the better can be the study of the factors that should control the sample. The degree of accuracy desired is an important factor. In many problems it is relatively unimportant whether 65 or 70 percent think the same way on a certain point; it is only important that it is a sizable majority. When it is important to get a more accurate percent-

age figure, particularly broken down by groups, all controls must be tightened and the sample taken more carefully.

In food surveys the results are consistently disappointing, particularly in the field of nutrition. Some time ago the late Franklin Roosevelt said that a third of the population was underfed. Judging from the available information, that was a serious understatement. If certain surveys in the past had been made differently this contention could be defended more authoritatively. It might have been that only a third was undernourished because of insufficient money to be well fed. It would not be surprising, however, to find another third underfed because of insufficient knowledge of what constitutes undernourishment.

Another factor in any study on nutrition is to be sure that a large enough sample, nationally and by groups, has been taken to allow an intensive study of certain groups. For example, the diet of Southern Negroes' is not the same as that of Negroes in the North; the diet of Southerners, excluding Negroes, would differ materially from that in other sections of the country. The food habits of Midwest farmers is not typical of the Midwest as a whole, because of such cities as Minneapolis, Des Moines and Chicago. The sample should be constructed to allow for intensive study of certain groups where the greatest nutrition problems are. If the sample could be detailed and specialized to provide adequate information on specific problems of specific groups it would throw a new light on the whole problem of nutrition.

SOME RECENT DEVELOPMENTS IN SAMPLING

by DR. A. J. KING, *Statistical Laboratory, Iowa State College, Ames, Iowa.*

The increased demand for accurate and timely information during and following the war has stimulated and hastened the growth and development of sampling.

Many problems are involved in getting a representative sample of some populations. In drawing a sample of people or families, the task would be simplified if a list were available giving the names and locations of all people living within the region to be sampled. Even if such a list were on hand at a given time, it would soon become out of date because of births, deaths and migrations of people.

Among the most popular methods of sampling used in the past are the mailed inquiry and the quota method. Both have some basic weaknesses.

The mailed inquiry method has been popular both with government and business. A large number of returns can be obtained at low cost per schedule but estimates from mailed inquiries are usually biased because the persons to whom the questionnaires are mailed may not represent the population about which information is desired and because those who answer may be a select group. In other words, those who answer the inquiry may not be representative of those who failed to answer or those who did not receive an inquiry. In addition, the expansion of the sample data to population estimates depends on certain historical data. For example, an average per family may be multiplied by some previous estimate or census count of the total number of families in the population. Any inaccuracy in this total is another source of error in the population estimate. The most recent census data may be from one to seven years old and when used may be seriously in error. Another limitation of mailed inquiries is that only short and simple questions can be used successfully.

The quota method of sampling is familiar to almost everyone because of the publicity that it has received by its use in election forecasts, public opinion polls and marketing surveys. In this method the population is divided into a number of strata or cells and a sample is drawn proportionally from each cell. The number of people to be interviewed in each cell is called the quota for the cell. The strata may be based on age, sex, occupation, geographic location and economic level. The quotas are based on historical data, which in periods of rapid change may be inaccurate. Usually the selection of the individuals within a cell is left to the discretion of enumerators, which is another source of possible bias. Furthermore, as with the mailed inquiry the quota method depends upon historical data as a basis for population estimates. On the other hand, the method is simple to administer and has a relatively low cost per interview.

In view of the need for improved methods of sampling, in 1938 Iowa State College in cooperation with the Bureau of Agricultural Economics began research in the area method of sampling for farm information. This method consists of dividing a region into small geographic areas which in Iowa usually contain from two to six farms. The most efficient size of area in terms of the amount of information obtained per dollar spent depends on such factors as the density of farms and roads, the availability of accurate maps showing the location of farmsteads, availability of aerial photographs, the length of the interview and the administrative and field structure for making the survey. Every unit of observation, people, families or farms, is uniquely associated with one and only one area. To obtain an unbiased selection of farms a certain number of these small areas may be selected at random. Then take all the farms whose headquarters fall with-

in one of the selected areas. If a farm has no headquarters, it may be included in the sample, if, for example, its northwest corner lies within one of the selected areas. If a sample of individuals is desired all of the people who live within the selected areas, or any predetermined subsample of them are included. People within the sample are personally interviewed to get the desired information.

The area method if properly used gives an unbiased estimate. Also, population estimates can be made from the sample without any information, such as historical census data, outside the sample itself. Since the total number of area sampling units in the population is known, population estimates may be made by multiplying the sample total by the inverse of the sampling rate. If the sampling rate is one in 20, the sample total is multiplied by 20. Other methods of estimation are frequently used when the required data outside the sample itself are of sufficient accuracy.

The area method has certain disadvantages in that maps showing the location of farmsteads, non-farm houses and roads, and frequently aerial photographs are needed. It takes time and money to delineate the area sampling units on maps. Also the cost per interview is greater than for most other sampling methods. However, because of the greater statistical efficiency of the area method the amount of information per dollar cost for many types of surveys may be less for this method than for others.

Early in 1943, the idea of a master sample occurred to Rensis Likert of the Bureau of Agricultural Economics. It was evident that there was a need for obtaining the required materials and for developing procedures for quickly drawing efficient samples of farms or rural people. By drawing a large master sample and by accumulating information about the farms and farm families included, many important factors affecting farm production, income and living could be studied by use of subsamples.

After considerable discussion among members of the Bureau of Agricultural Economics, the Census Bureau and the Statistical Labora-

tory at Iowa State College, a decision was reached to draw a national sample of about 300,000 farms. The work was assigned to Iowa State College because the group there was experienced in such sampling as a result of the research that had been carried on for several years cooperatively with the Bureau of Agricultural Economics.

Three primary strata were defined on the basis of incorporation and density. The total area of the United States was classified into incorporated places, unincorporated areas relatively densely populated and open country or unincorporated areas rather sparsely populated.

General highway maps were obtained for each of the 3,070 counties in the United States. These maps indicate the location of farm and non-farm dwellings, roads, streams, corporate limits of cities and other culture. All of these maps were divided into count units. The delineations were so made that they included a minimum of six farms and eight dwellings and a maximum of 30 farms so that the boundaries could be easily identified. Those count units that were drawn in the sample were subdivided into sampling units of which one was drawn at random to be included in the national sample. The master sample contains 67,000 sampling units which average 2.5 square miles in size and contain an average of 4.5 farms.

Before completing the master sample, the Bureau of the Census wanted to extend the sample so that it would represent people in the entire population. The areas set up for agriculture were not efficient for population samples in cities and villages where the size of the sampling units must be determined by the number of people rather than the number of farms. At present the work of drawing a master sample of city areas is being completed. Sanborn and other city maps, special census tabulations by block in large cities, and aerial photographs are being used for drawing this sample.

The master sample at present consists mainly of materials. These include 3,070 count maps, one for every county in the United States, on which sample areas have been designated together with materials useful for drawing

samples. The present master sample can be extended or supplemented if other samples of either agriculture or persons are needed. For the master sample farms data will soon be available from the 1945 agricultural census. These data will be useful in drawing subsamples of the master sample.

In addition to the county maps, the available materials consist of listings of all town, villages, cities and other densely populated places and areas having an estimated population of 100 persons or more; tabulations of the ex-

pected numbers of farms and dwellings by small geographic areas and their cumulative totals; and aerial photographs for about 91 percent of the 67,000 sample areas in the master sample. Using these materials a number of county, state, regional and national samples of varying types have been drawn for state, federal and commercial concerns. Modifications of the area method of sampling based on additional research, experience and data are expected continually to improve its adaptability and efficiency.

A COMPARISON OF SAMPLING METHODS.

by DR. GEORGE H. BROWN, *University of Chicago, Chicago, Illinois*

At the present time there is a considerable amount of discussion among research practitioners concerning the most appropriate method of selecting a sample for the study of problems involving the measurement of consumer preference. The papers presented this afternoon by Dr. Roper and Dr. King are not only examples of the different points of view which are current, but are evidence that the differences represent variations in degree of emphasis rather than lack of agreement on points of fundamental theory. The purpose of this paper is to point up the issues involved in selecting a sampling method, and to indicate if possible a general method of determining which type of sample shall be used for particular cases. In doing so, considerable attention will be given to non-proportional stratified samples, a type of sample which has not been widely used by practitioners although it has long been recognized in theory.

For the present, attention is directed to the fact that all sampling methods can be classified into random samples or stratified samples.¹ A random sample is one in which each unit within the prescribed universe has an equal chance of being selected as each unit of the sample is being drawn. All estimates of sampling error are based on the assumption that truly random samples are drawn, although adequate procedures are available to make allowance for the fact that the samples may be drawn without replacement from a finite universe. There is considerable reason for favoring the random sample since it conforms to the theoretical

models, is free from bias, and tends to represent the universe in *all* of its infinite characteristics. A single such sample can be used for many different purposes with mathematically determinable limits of error.

It would seem from the above that there would be no question concerning the universal use of the random methods of selecting samples. There are, however, two important drawbacks to the procedure involved. First of all, it has been found impossible to draw truly random samples unless it is possible to identify each unit of the population and to make sure that the unit designated by the sampling directive actually appears in the sample. For consumer samples it has been considered impossible to identify all the units in a population as large as the United States, and even where this is possible, as is the case of automobile owners, workers entitled to social security benefits, and other groups, it is very difficult to secure answers from each of the units to be represented in the sample. Illness, suspicions, language difficulties and rugged individualism are only a few of the factors which prevent the sample design from being executed in detail. Of even greater importance is the extremely high cost of operating a coast-to-coast random sample. The information presented this afternoon by Dr. King gives some insight into the cost of defining and selecting a random sample, although even in this case, pure randomization is not achieved. For private industry the cost of a nation-wide random sample is prohibitive.

It should be pointed out that tremendous

¹ It has been customary in statistics to differentiate between stratified-random, stratified-purposive, and purposive samples. In all these cases, however, it is necessary to have *a priori* knowledge concerning characteristics of the universe, including the weight of the stratum in the universe as a characteristic, and hence the more refined differentiations are ignored in this paper. Where data concerning the importance of certain strata in the universe is known, it is possible to reduce the error of sampling appreciably. In theory it makes no difference whether the sample is first subdivided into groups within which the items are selected at random, or whether the original units were drawn at random and later grouped into strata. The only data needed for the computation are the standard deviations within the subdivisions of the sample and the importance of such subdivisions in the universe.

strides have been made in recent years towards cutting the cost of overcoming the space dimension of random samples. In commercial research the experience of the Industrial Surveys Company in developing a high response with a continuous mail questionnaire; the progress of the A. C. Nielsen Company in the development of a machine for the continuous recording of the stations to which a radio is tuned; and the pioneering efforts of the Quaker Oats Company in establishing a permanent staff of field interviewers are examples of ways and means of securing spacially well distributed samples with a minimum of traveling costs. Equally important is the recent work in area sampling such as described by Dr. King. Area sampling is a device whereby the areas in which groups of individuals live become the sample unit. It is therefore possible to describe the unit in such a way that it can be identified quickly and accurately by the field investigator. The substitution of identification of the area for the identification of the individual is a marked step forward in the application of the technique of random sampling. There are, of course, difficulties inherent in selecting areas of approximately equal population since this step requires the use of the census materials or more recent information in the form of aerial photographs, fire maps and other data which may reflect dwellings rather than person or family units. These difficulties are well known and for many types of problems are of lesser importance than handicaps associated with other methods of sampling. There still remains, in spite of the progress recorded here, a very large element of cost in the definition and application of the random sampling technique. For this reason alone, it is desirable to consider alternative methods of drawing samples from pre-defined universe.

In fact, it was the preoccupation with the high cost of random samples which led early students of consumer measurements to experiment with stratified sampling.⁽¹⁾ The basic procedure, as has been outlined by Dr. Roper, has been to select the individuals to be included in the sample in such a way that the sample is representative of the universe in certain supposedly known and measureable characteristics, and to ignore or restrict the representa-

tion of other characteristics. The known characteristics of consumers in the United States are drawn largely from the census data. Age, education, occupation, nativity, number in the family unit, color, and distribution by county units and city size, constitute the basic information which can be used as controls in the purposive selection of the sample. Since each of the controls can be divided into two or more strata the number of subdivisions that can be defined in the sample builds up very quickly, and consequently it becomes necessary to select the controls and strata carefully in order to prevent the sample from becoming unwieldy. A further limit to the degree of stratification arises from the fact that it has been customary to select the numbers in each of the subdivisions of the sample in such a way that it is proportional to the importance of that subdivision in the universe, *i. e.*, if four percent of the population is reported by the census to be foreign-born white between the ages of 25 and 35 in cities of 25,000 to 1,000,000, the sample subdivision defined by these characteristics contains four percent of the numbers in the total sample. Since the number in the sample subdivision cannot be less than one, the degree of stratification is restricted by the size of the total sample.

A great many limitations to the proportional stratified sample, frequently called quota sampling since the interviewers are required to secure data from pre-determined numbers of designated types of individuals or families, have been recognized by both the proponents and opponents of the method. Perhaps time can be saved by summarizing the major objections to the method under four general headings:

1. The quotas, or controls, are based on data which are so old as to constitute the introduction of bias into the sample instead of leading to greater accuracy;
2. The range of control data available, even when it is up to date, is inadequate for many types of consumer studies;

3. The selection of such controls as have been available have indicated that the sampling procedure has been more of a ritual than an intellectual process, and;
4. The distribution of the units in the subdivision of the selective samples have been far too restrictive, particularly in regard to spacial distribution.

These are severe indictments and cannot be passed without comment even in a paper as brief as this one. In regard to the present inaccuracy of control data, everyone recognizes that the war has caused marked shifts in the distribution of populations and that there have been changes in age distributions and other factors, since the last census. It remains to be shown, however, that for the study of individual problems the degree of error introduced by these changes is greater than the reduction in error of a stratified over a random sample. Or since there is such a marked difference in the cost of the two types of samples, that the accuracy per dollar of cost is greater with a simple random sample than with a quota sample based on outmoded census data.

The inadequacy of the census materials as sample controls has received less attention than its lack of currency but, in the opinion of the author, it is a far more serious factor in limiting the application of the quota method of sampling. Although researchers bewailed the lack of good data on income distribution, the attempt to secure information in the 1940 census proved inadequate because of the difficulty of securing field data. Even so, the rapid shifts in family incomes during the years immediately following 1940 would probably have outrun the ability of the census department to tabulate their findings. There are, however, other gaps in our information about the universe of consumers which may well be more important in problems of consumer behavior. The number of community organizations to which an individual belongs, his pri-

mary mental abilities as opposed to his formal education, the size of the family in which he was reared and so on are examples of factors relevant to many problems. It is, of course, not possible to expect a national census to include these factors, although, even if such data were collected, there would still remain such matters as the degree of retail distribution by product by area which is of great importance in the study of brand purchases. The existence of these gaps constitute serious limitations to the use of stratified samples.

The third criticism of the procedure in stratified sampling deals with a factor which can in part be overcome. It concerns the use of a more or less standardized set of controls which are observed in a routine manner by persons dealing with consumer problems. The reason for this practice is a lack of understanding of the theory of sampling and a consequent tendency to adhere to practices which "work" rather than branch off into new and untried methods of determining controls and strata. Time does not permit a full discussion of this point, but perhaps it may be sufficient to say that the primary controls and the detail of the strata employed should be based on information obtained from past studies or, where such data are lacking, from a careful analysis of the first three or four hundred interviews. Controls which are found to have no relationship to the problems being studied may be eliminated while those highly correlated with the problem should be carefully studied to determine if greater stratification would lessen the variation within the sub-cells of the sample. Where a wide variety of problems are under consideration in a single survey the ability to effect much selection among the available controls is, of course, greatly lessened.

The final criticism of quota sampling, *i.e.*, that the distribution of the units selected for the various subdivisions of the sample is unduly restricted, can in part be defended. Here again the consideration of cost may lead the researcher to take all 80 of the interviews among native born white persons residing in cities between 25,000 and 100,000 in north central states in one or two of the available cities meeting this criterion in the area. Moreover,

the interviewer is likely to take the interviews within a small area within the city rather than throughout the city proper. The bias introduced by this procedure, as opposed to the error of a random selection within the subdivisions, may or may not be important depending upon the nature of the problem being studied. If, for example, there is very little difference in buying behavior between individuals located in different cities, other things being the same, then the failure to include all cities within the size range is not an important source of error. If, however, some other characteristic, such as degree of industrialization is important to the study, the concentration of interviews in only one or two cities may lead to serious error.

From what has been said it would appear that the continued use of selective samples is foolish. Actually selective samples have proved themselves and are now proving themselves to be much more accurate than random samples in the field of consumer behavior. The straight proportional selective sample is a regular tool of the market analyst and the accuracy of the method is checked year in and year out by reference to company sales, industry sales, and other up-to-date census-type data. The continued success of the forecasts of popular elections is further evidence of the adequacy of the stratified sample, and to this performance should be added the accuracy with which stratified samples reflect such recent data as number of homes with telephones, ownership of automobiles and other information reported on an annual basis by particular industries. The

assertions made here about proportional stratified samples do not cover all national consumer studies, as there have been some conspicuous failures among well stratified samples. It must be said, however, that the failures are distinctly the exception and not the rule.

Even if the pragmatic test of the selective sample were not so convincing it would still be necessary to give attention to the non-proportional selective sample before attempting any evaluation of the various sampling methods. The non-proportional sample has long been recognized by theorists as the ideal sample in terms of minimizing the amount of error for a sample of a given size. The model calls for distributing the units within the sample according to both the weight of the subdivision of the sample in the universe (the proportionality concept) and the degree of variation (the standard deviation) in the subdivision.(2) For example, let us assume that a universe can be divided into four strata whose population as a proportion of the total universe is 40, 30, 20, and 10 percent respectively. Assume also that the standard deviation of the variable being measured by the sample (cups of coffee consumed per day, for example) is 1, 2, 3, and 4 for the same strata. Table I shows how a group of 2,000 interviews would be divided in a proportional stratified sample and how they would be divided in the ideal sample. It is assumed in the theoretical case that the units within the strata (or within the smaller subdivisions of the sample if there should be more than one control) are taken at random from the universe.

TABLE I

An Illustration of Proportional And Non- Proportional Samples From Strata of Differing Weights And Differing Standard Deviations

Stratum	Proportion in stratum in the universe wi	Standard deviation	oiwi	$\frac{8}{\text{oiwi}}$	Proportional sample of 2000	Minimum error sample
A	40	1	40	.20	800	400
B	30	2	60	.30	600	600
C	20	3	60	.30	400	600
D	10	4	40	.20	200	400

In spite of the endorsement of the non-proportional sample by statisticians it has seldom been used by students of consumer problems. This is in part due to the difficulty of randomizing the units in the sample sub-division, but in part it is also due to a curious paradox. If, for example, no study of a particular problem has been made beforehand it is impossible to estimate the standard deviations in the sub-divisions of the sample. The assumption that the standard deviations are the same in all the sub-divisions leads to a straight proportional sample. On the other hand, those situations where continuing research is undertaken involve such a complex tabulating schedule that practitioners have been loath to introduce non-proportional sampling because of the weighting procedure required to bring the non-proportional sample to the point where simple averages can be computed. There is reason to believe, however, that this paradox can be broken by proper tabulation procedures. For example, in the case illustrated in Table I the data in the minimum error sample could be transcribed to punch cards and the cards duplicated to bring their numbers into the proper proportion. Since stratum D has twice as many observations as called for in a proportional sample the number here would be taken as the base and other strata made proportional to it. Three copies of each card in stratum A would be made, bringing the total to 1600 cards or eight times as many cards in stratum D. The cards in stratum B would be duplicated once, bringing the total cards to 1200. In stratum C every third card would be duplicated as the total number required for proportionality to stratum D would be 800.² A less important reason for the reluctance to adopt non-proportional sampling has been the difficulty of winning the confidence of other people in this sampling method. It has been very hard to persuade business men that any sample could give reliable results. Although there has been a common sense grasp of the idea that the sample is a miniature of the universe which reflects each of its various attributes in their true proportions, the task of presenting the notion of the non-proportional

sample to the uninitiated has undoubtedly served to hold up progress in sampling techniques. This, however, is far from being an insuperable problem and in time can be overcome. Once the vested interest in proportional samples has been overcome the way will be opened for consideration not only of the "ideal" type of sample described above, but of the preliminary sample in which equal numbers are selected for the sample subdivisions without regard to their weight in the universe in order to estimate with reasonable accuracy the several standard deviations. Non-proportional samples have already been used in isolated instances and the success of these endeavors may well lead to a better understanding of basic sampling procedure.³

Enough has now been done in describing the general methods of selecting samples to provide a basis upon which to make some generalizations concerning the appropriate procedures to follow in particular cases. The most important point to make is the fact that no one method of sampling is correct for all problems at all times. Each of the various methods has its own set of advantages and disadvantages which must be matched against the problem to be studied. Area sampling or random sampling has the greatest freedom from bias but may well represent the most costly sample in terms of time and energy for a given level of sampling error. Stratified samples presuppose accurate and adequate data concerning the universe, and also require an *a priori* knowledge of the relationship of the controls to the variable being investigated. Non-proportional stratified samples give even greater accuracy for a given number of interviews, but call for more expense in the tabulation procedure and the added work of the sample design. For new problems or those involving a small geographic area a random sample is certainly indicated. For continuing studies involving a large variety of consumer behavior problems a proportional stratified sample might well prove to be the best, provided care is used to select the controls and strata having the greatest accuracy and the

² The total number of cards to be tabulated would be 4000, but the estimate of the error of the sample would, of course, be based on the 2000 original interviews.

³ After this paper had been prepared the author was informed by three research agencies in Chicago that non-proportional samples were in regular use in their own operations.

most relevance with respect to the various problems under consideration. Continuing studies of narrowly defined problems may well be conducted with the use of non-proportional stratified samples, provided again that the available data concerning the universe is reasonably accurate and highly relevant. It may be that stratified samples should be used in the years immediately following a census, while a random sample might be used in later years. In other cases the method of sampling might be so designed that in part it would be carried out as a highly stratified sample and in part as a purely random sample. The circumstances in each particular case should be the deciding factor and the decision should be based upon a thorough understanding of sampling theory rather than upon the blind adoption of a sampling procedure selected by a particular authority for a problem similar to, but not identical with, the one at hand.

The second point which should be emphasized is that much of the information concerning the appropriate sampling method can be obtained as the sample is drawn. This observation is based on the assumption that consumer studies usually involve a thousand or more observations and that the time element is such that the study may be conducted over a period of several weeks. Where this is true, it is possible to secure data on all available controls from the

first few hundred units in the sample, whether a random or tentatively selective sample be drawn, and sufficient information obtained from the early interviews to re-design or direct the procedure for selecting the remaining units in the sample. Intermediate tabulations during the process of sampling are not new to consumer research, but the purpose is usually to check the size of the sample rather than to guide the sample design.

As a final factor in the discussion of methods of selecting samples, a word of caution should be introduced concerning the possible over-emphasis of this aspect of research technique. The error introduced by bias in the sampling procedure is only one of the many problems that arise to plague the investigator. Important as it is, sample bias must take its place alongside of such matters as leading questions, lack of understanding on the part of field workers, over-confidence on the part of the respondents, and the hundred and one other similar hurdles that stand between the investigator and the truth he seeks.

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INTERVIEWING FOR FOOD HABIT SURVEYS

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From the psychologist's point of view, the interviewing side of surveying is much more interesting than the process of locating the people to be interviewed. Surveying agencies go to a great deal of trouble to find exactly the right respondents to make up a representative sample but if the information which is desired from these respondents is not properly obtained this effort has been wasted. This paper will be concerned with certain procedures in interviewing, particularly with the methods being used by the Division of Program Surveys in the Bureau of Agricultural Economics.

There are several ways of interviewing just as there are several ways of sampling. The specific method to be used in any particular survey is usually determined by the objectives of the survey. The questionnaire is an instrument for meeting these objectives and its form may vary considerably depending on the nature of the information to be obtained.

There are two general types of survey questions in common use. The fixed-alternative question is widely used and is especially applicable when the material sought is common knowledge. The alternative answers are simple, and the people responding can understand the question without difficulty. This type of questioning presents the respondent not only with the question but with a list of possible answers from which he makes his selection. These alternatives may be in the form of a yes or no choice, a five-point attitude scale or a series of independent answers.

A type of question with which the Division of Program Surveys is closely identified is the so-called open question. With this method of interviewing, no attempt is made to provide a ready-made answer for the respondent. The question is framed in such a way that the area

of answer is definitely indicated, but the respondent chooses from his own mental content the answer he is going to give.

The open question seems to be especially useful in two areas, those of attitude and of ignorance. Many attitudes are highly complex. They are almost always qualified by provisions and reservations which are difficult for the surveyor to assess unless the respondent is given an opportunity to express them. The open question permits the respondent to give a complete statement of his point of view and to explain why he feels as he does. Attitudes are especially hard to measure when they relate to problems on which the respondent is poorly informed. It would be very difficult at present, for example, to measure public attitudes toward the atomic bomb. The implications of this new development are so vast and so far beyond the thinking of the common citizen that it is virtually impossible for the public mind to understand its full meaning. But open interviewing can bring out the context of thought in which the public views atomic power, its misunderstandings, its fears, its feeling of personal involvement. These facts are very much more accessible in the free, narrative type of interviewing which the open question permits than they are in more rigid types of questioning.

In general the open question procedure may be said to have three basic advantages. In the first place, the interviewer is able to attain a conversational situation with the respondent. Virtually everyone who has done interviewing, either public opinion interviewing, field interviewing, or any other kind, is agreed that unless the interviewer is able to establish friendly rapport with his respondent, the material which he gets is apt to be very incomplete and sometimes quite false. In public opinion surveying the problem of rapport is especially difficult

because the interviewer is constantly going to the doors of people he doesn't know. He must win the confidence of the people he talks to and induce them to cooperate fully in the interview. The creation of a friendly atmosphere is very much facilitated if the interviewer is able to conduct his interview by using questions of a conversational type, such as "How are you getting along since the end of the war?" or "Is anything making it harder for you now than it was before?" These questions closely resemble the kind used in everyday speech and from nearly all respondents they elicit the kind of answer one gets in ordinary conversation.

The importance of rapport is well demonstrated by the wealth of information that can be obtained when good rapport is established. It is possible, for example, through the use of open interviewing methods to ask a sample of people how many war bonds they own and how much money they have in the bank and to obtain total estimates which check quite closely with actual bank and Treasury Department records. Successful interviewing on subjects such as these requires a well-constructed questionnaire and a well-trained interviewer.

Secondly, the open question is advantageous in that it elicits a full answer. A full answer is not of any particular value in itself but it is valuable because a person giving a narrative statement instead of a yes or no explains enough of his attitude so that the interviewer knows two things: he knows how the respondent understood the question and he understands what the respondent's answer means. When the respondent gives a long conversational answer he can hardly fail to make clear the meaning which the question had for him and his own reaction to it. For example, the woman who answered a question on government control of profits by saying she was opposed to it "because only the Lord could control the prophets" demonstrated that she had given the question a different interpretation than the interviewer had intended. When a respondent merely checks an answer in a printed list which the interviewer hands to him there is no way of knowing whether he understood the question correctly or not. Few people like to appear unintelligent or uninformed in

an interview; the ready-made answers of the fixed-alternative question offer an easy escape from the necessity of admitting ignorance. Even when the question is entirely clear a detailed answer is often necessary to explain the respondent's answer to it. The degree of intensity with which an attitude is held, the degree of assurance with which issues are understood, the reservations with which opinions are qualified are apt to be lost if the respondent is not given an opportunity to bring them into the interview.

The third advantage of the use of the open question lies in the fact that it permits the respondent to contribute to the interview the things which are important to him but which were not anticipated when the questionnaire was written. It is impossible to predict at the time a questionnaire is made up what the total range of answers to the questions will be. Even when the questionnaire has been tried out and a number of sample interviews have been obtained, it is very difficult to anticipate what all the important reactions to the questions will be when the questionnaire is given to a broader sample. This is a serious consideration when fixed-alternative questions are used since the list of possible answers which is devised when the questions are written virtually eliminates the possibility of recording any unforeseen information. The surveyor assumes that he knows all the significant answers before the survey begins.

When the open question technique is used this is not such an important problem; the freedom which is characteristic of this type of interviewing affords the respondent full latitude in giving his answers. An example of the recording of unexpected responses is found in a series of studies of public attitudes toward the purchase and redemption of war bonds. In 1943 in a survey of some 2,000 persons there appeared 10 interviews in which the respondents repeated the following rumor; "The war would end quickly if people would stop buying war bonds. Bonds are used to buy munitions; since the war could not continue without munitions, the war would end if people refused to buy bonds". This rumor was not anticipated when the questionnaire was written; it was

not encountered on the pre-test of the questionnaire. It was recorded because the open interview technique allowed the respondents to volunteer information not specifically asked for in the questionnaire. This rumor was followed in subsequent surveys; it increased in incidence progressively until the war ended.

These are the three major advantages of the open interviewing technique. It should be observed that open questions require special treatment both in interviewing and in analysis. In using these questions the interviewer must take shorthand or some version of speed-writing in order to record the full response. A single interview may be a document of several typewritten pages. The interviewer follows the interview schedule exactly. He uses the questions just as they are stated and presents them in the order in which they are listed. The specific wording of the questions is developed in a pre-test which may require from 50 to 150 trials of the questionnaire. The analysis of the answers to open questions also requires special techniques. It is essentially a problem of classifying together answers which are said differently but have the same meaning.

The Division of Program Surveys has recently been using questionnaires in which both open questions and fixed-alternative questions are used. By asking questions in both ways it

is possible to make some estimation of the "salience" of each alternative to the respondents. For example, if people are asked to name the foods they think are essential to good health they will commonly name a rather limited list of items. If they are then shown a printed list of foods and asked the question in relation to it, they will ordinarily add new items which they had not volunteered in answer to the open question. Some foods are given almost as often in answer to the open question as they are to the list question; others are almost never volunteered but are commonly selected from the list. Apparently these foods differ in their "salience" or prominence in the minds of the respondents. This type of analysis is still in the experimental stage but it offers considerable promise for the combined use of open and fixed-alternative questions.

In conclusion, it should be emphasized again that locating the respondent is only half of the surveying job. Everyone agrees that unless a survey is based on a well-selected sample it had best not be done at all. The effort necessary to achieve a representative sample is unquestionably justified. But the interviewing side of surveying requires equal attention. All the effort spent in locating a true cross-section is of no avail unless the interview brings out a complete and valid statement of the respondent's attitudes and behavior.

REGIONAL FOOD HABITS AS RELATED TO FOOD ACCEPTANCE.

COLONEL PAUL E. HOWE, *Nutrition Consultant to the Public Health Division,*
SUPREME HEADQUARTERS OF THE ALLIED EXPEDITIONARY FORCES

Food acceptance is tied up with many factors which are largely psychological, the strongest probably being the food habits of the family from which an individual comes. Here methods of food preparation, good or bad, play a significant role. Food habits of a locality in the United States are undoubtedly based on two major factors, the predominating nationality of the country from which the people come and the food available in the community. Even in the latter case the methods of preparation characteristic of nationality modify the use of the abundant foods of a region and introduce a secondary factor into the acceptance of the same foods by persons of another region.

Factual evidence of the effect of previous food habits on the acceptance of food in the Army is apparently very limited. The failure to accept new foods or methods of preparation are so much more obvious that they are much easier to notice and relate than the lack of acceptance after a period of exposure to particular foods.

With regards to methods of preparation, in a mess at Fort Meade parts of two companies messed together. One company was largely from the New England States with a New England mess sergeant and the other from the South with mess sergeants from the same region. The mess sergeants supervised the cooking on alternate days. In a survey of the mess it was noted and verified that the consumption of food was greater by the men from the region from which the mess sergeant came on the days he was in charge of the kitchen.

There were many cases of failure to accept fresh vegetables beyond the standard potatoes, tomatoes, corn, stringbeans, spinach and cabbage. There are special cases where even some of these foods were not accepted. In certain

instances when other vegetables were well prepared, the cook knew that only a small portion of the quantity he was preparing would be eaten and the remainder would go into the garbage, or elsewhere if the garbage can was under close scrutiny.

Regional food habits are very definite with regard to certain basic carbohydrate foods such as rice and potatoes, and individual foods such as corn bread and beans.

At times variety or greater profusion of so-called acceptable foods have been resorted to when all that was needed was a slight variation in the method of preparation and good cooking. There is a story of a hospital in Manila where the surgeon and the mess sergeant tried to satisfy complaints by getting a greater variety with little results. Finally they decided the problem was getting out of hand so they returned to the usual foods which were eaten with complete satisfaction. A variation on such a condition is the case of a very successful Washington hotel. In addition to good preparation and service, it kept its clientele enthusiastic about a fairly simple menu by a slight variation in hot breads served at each meal.

The psychological conditions under which food is eaten play a part in food acceptance. In Army messes where the troops were consuming certain foods satisfactorily, at most of the tables there would be considerable waste. At an occasional table there was no waste and the serving dishes were completely empty. One possible explanation was that some one showed interest, no one complained and everybody ate heartily. This is the chief factor that determines food habits in youth.

From a national point of view a British officer engaged in studying nutritional problems of the Royal Air Force told of the delight

certain troops had in American rations when they first lived on them but later their established habits prevailed and they insisted on returning to British rations.

It is obvious that regional food habits in the broadest sense are a factor in the acceptance of foods and that such habits persist for a long time. The opinion was expressed that the soldier after a year or so gradually becomes accustomed to the foods he eats in Army messes and likes them.

There are two or three phases in which regional food habits interfere with or promote the eating of basic foods or unusual foods, *i. e.*, when they first are presented or after they have been presented for a relatively short time and when they have been presented for a season or longer. The ultimate test of acceptance might well be to determine what the individual prefers when two foods or methods of preparation are presented simultaneously, and when he eats the new food or accepts the new method of preparation in preference to the one to which he was previously accustomed at least 50 percent of the time.

It would appear that the Army and Navy should have, or could obtain, information on the subject of previous food habits. To do so it would be necessary to lay down the conditions under which the study would be conducted and what evidence would be necessary to show that a positive or negative influence has been demonstrated.

Since previous food habits do influence food acceptance, at least temporarily, profitable studies might well be conducted with individuals from different regions on such questions as the best methods of modifying acceptance of foods, the classification of foods and methods of preparation that present the least and most difficult problems of acceptance, the extent to which texture, color and flavor affect acceptance and which of the factors have the greatest influence. Along with such data could well be included studies of the qualities of food that promote the acceptance of the same foods for long periods of time and those that cause early dissatisfaction and even rejection under conditions of monotony. While subjects from the United States are rather well accustomed to variety there is evidence that some types of food are acceptable over longer periods of time than others.

Results on studies of the effect of regional food habits in relation to food acceptance can be useful in the development of a sound nutritional program for the country as a whole. They should reveal nutritional deficiencies and their causes. The United States agreed at the first United Nations conference at Quebec to take all measures within its power to raise the level of nutrition and the standard of living of the people under its jurisdiction and to report to the other nations the measures taken and progress achieved.

FOURTH SESSION

PROBLEMS IN THE FEEDING OF ARMY AND CIVILIAN POPULATIONS

Thursday, 6 December, 1945

CHAIRMAN
CAPTAIN WALTER A. MACLINN,
EXECUTIVE OFFICER.

*Quartermaster Food and Container Institute
For The Armed Forces*

RESHAPING AUSTRALIAN AGRICULTURE TO UNITED STATES ARMY NEEDS

by MAJOR CARL R. FELLERS, *Chief, Laboratory and Inspection,*
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Late in 1942 because of an acute world shortage of food, a military mission was sent to assist the Australian Commonwealth in increasing food production for the Allied Armies. This mission consisted of technologists in agriculture, farm machinery, dehydration, canning and foods. The entire procurement program was headed by Brigadier General Hugh B. Hester. A group of about 80 officers and enlisted men established three subsistence laboratories at Sydney, Melbourne and Brisbane with food inspection offices at Perth, Hobart and Adelaide. At these points more than three billion pounds of subsistence were inspected and approved for use by the United States Army and Navy. Huge warehouses located at strategic localities were used for storage until ships could transport the food to the great northern bases for use by American fighting men.

Excellent cooperation was secured from Australian government and state officials. Lend-Lease greatly assisted the project by giving the highest priority in importing agricultural seeds, farm and canning machinery, trucks, tractors and all kinds of equipment and materials. Australia paid back in food, clothing and services, about 82 cents on the dollar, the best record of any allied nation.

Vegetable production was increased about two and one-half times so that by 1944, about 600,000 acres were harvested giving 150,000,000 pounds of fresh vegetables and 6,000,000 cases of canned vegetables for the United States forces. Many foods were packed that were previously not canned. Six pea canneries and four sweet corn canneries were set up in addition to the packing of Swiss chard, also known as silver beet, cabbage, cauliflower, snap beans, potatoes, tomatoes, citrus fruit and apple juices,

apple sauce, and many canned meat products for the Army. Among the latter were corned beef, meat and gravy, chili con carne, pork sausage, C rations, pork luncheon meat, pork and beans, ham and eggs and rabbit. Fish canning was also greatly increased.

The American technologists assisted in the establishment and operation of 36 vegetable dehydration plants for potatoes, carrots, cabbage and onions. The first quick freezing plant in Australia was set up in Sydney for freezing vegetables.

Dehydrated vegetable production was increased from nothing to 14,000,000 pounds in 1944, and 24,000,000 pounds in 1945. About 250,000,000 pounds of meat were obtained in each of the years 1944 and 1945.

The 7,000,000 bushel apple crop which was previously exported largely to England, was manufactured into canned apple juice, sauce, butter, canned sliced apples and evaporated apples. Pears were used also for canned juice.

Extreme care was necessary in the packing of vegetables because of a lack of uniformity in canning and processing procedures. There had been two botulism outbreaks among United States Army troops involving 26 men with nine deaths. These outbreaks were caused by under-processed canned beets which were packed previous to the coming of the American Food Mission. Australian soils are badly contaminated with *Clostridium Botulinum* spores. It was necessary to rewrite completely the existing specifications for all heat-processed non-acid foods so as to insure safe processing. By careful field and laboratory inspection further botulism outbreaks were prevented. In the Sydney laboratory alone reports were made on 4200 official

samples. These were not all on food samples. Many were made on canvas, leather, cloth, water, liquor, water and mold proofing materials, embalming fluid, post exchange goods, soap, and shoe dressings. A great many lectures were given and friendship with Australian scientists, technical societies and universities was cultivated. Schools were conducted not only for United States technical personnel but for Australians as well.

Inspection of food supplies in New Guinea and other combat areas was an important part of the work and acquainted the technologists with the weather and other conditions at the northern bases. Rainfall of from 100 to 200 inches a year plus high temperatures and lack of shelter caused very rapid deterioration of all kinds of Army equipment and material, including foods. Cases and cans would often rot and rust through in three or four months. Losses were enormous. There was also much loss from bombing and other enemy action. Living conditions were very primitive but after March, 1943, the food situation was reasonably good. Previous to this date there had been real hardships and poor distribution of subsistence, but there was an acute lack of variety.

Enormous quantities of flour, rice, baking powder, salt, sugar, syrup, dessert and ice cream powders, dairy products, candy, chocolate, essences, spices, coffee, tea, jams, peanut butter, honey, yeast and cereals were procured. The quantity of perishable supplies was limited by available shipping space which was always scarce and inadequate. Freezer storage and refrigerator space on ships was especially scarce. Generally speaking, only boned meats were shipped because of the shortage in freezer space.

In 1943 and 1944, Australia and New Zealand supplied about 50 percent of the food used

by the United States Army in the Southwest Pacific Area. By 1945 the number of troops had increased to such an extent that the percentage of food supplied from Australia and New Zealand had decreased to 35 percent.

The American soldier is allowed five and one-fourth pounds of food a day or about 4500 calories. He is the best fed soldier in the world. Wherever possible the ration is so balanced that known nutritional requirements are satisfied. In the Pacific area there was a possible deficiency of calcium, thiamin, riboflavin and ascorbic acid. These deficiencies were partially corrected by the addition of minerals and vitamins to some of the prepared foods. For example, flour and dry yeast were fortified with thiamin, riboflavin and calcium. Salt contained 70 pounds per long ton of added calcium carbonate. Thirty milligrams percent of ascorbic acid was added to all the canned apple juice. In many areas, especially on remote islands, vitamin pills were issued freely, and salt tablets to prevent heat prostration were always available.

The Food Mission accomplished much in addition to the huge food supplies which it helped to produce. Good will, friendly cooperation and training of Australians and New Zealanders in modern food preservation methods are lasting results. The introduction of new machinery and equipment and instruction in growing and packing vegetables advanced their food production program by 25 years at least. The American Food Mission set Australians and New Zealanders up as competitors in the world food trade, but in these days of hungry nations and dire predictions of further strict rationing, it is to be hoped that these two countries will be contributors along with the United States to feeding a hungry world.

SOME FOOD PROBLEMS OF THE WORLD

by COLONEL PAUL E. HOWE, *Nutrition Consultant to the Public Health Division, SUPREME HEADQUARTERS OF THE ALLIED EXPEDITIONARY FORCES.*

This discussion will outline briefly some of the food problems encountered by the Army in various parts of the world. Unfortunately these observations are limited because the Army has little first-hand information about the food habits in countries in which it operated. The parts of the world having low standards of sanitation were fortunate because health conditions in the Army are much safer than in local homes and restaurants. Everyone who was overseas recognized the greater attention that American troops gave to good sanitation in foreign countries than they did during training and maneuvers in this country.

The Public Health Division of Supreme Headquarters of the Allied Expeditionary Forces in Europe was concerned with determining the nutritional status of the populations of liberated and occupied countries insofar as it was related to health and unrest. Activities covered most of the countries of Western Europe. Conditions, bad as they were in liberated countries, were such that there was relative improvement in the nutritional status during the period of combat because of the local supply or because of food brought in by military authorities. The condition in an area in The Netherlands was the most serious at the time of its liberation. It was so bad that the war lasted longer on that account.

There was considerable loss of weight in all countries but in spite of this nutritive deficiency, the condition of the people was relatively good. The character of the dietary, a Spartan one, is believed to be one of the reasons. It consisted principally of high extraction flour, potatoes and leafy vegetables to which was added all of the more interesting and supplementary foods that they could obtain. Meats and fats were particularly short for all categories and milk was very limited for the adult

categories. The working mothers, adolescents and persons with fixed incomes were the worst off. The aged who had no help and could not get out to obtain additional food suffered most in Holland.

The ration and operations in the various countries took care of certain classes of people. The vulnerable groups, the pregnant and lactating women and young children, received additional food including milk. The allowances for children in the categories from birth to three years and from three to six years amounted to more food under the ration than they normally consumed. The result was that families with young children were in a sense better off than those with older children. Workers of various classes, hospitals, schools and soup kitchens were allowed additional food.

Collective feeding included meals for the poor or those with limited income, school children, nursing and lactating women, returned prisoners of war and the aged. They operated under various names, such as Entre Aid in France, Winter Help in Belgium, Central Kitchens in The Netherlands, Swedish Help and Danish Help in Sweden and Norway. Danish Help was not spoken of nor was it always as direct as the Swedish Help because the Germans might have taken more food from Denmark for their own use if they had known it existed. Food from such sources was supplied free or at low cost. Where coupons had to be surrendered more food could usually be obtained in the markets which was of additional assistance. Factories conducted canteens where food was obtained under the rationing plans or from black markets and country farms.

The ration levels were usually lower than necessary for the maintenance of weight and health except for small children. Additional

food was obtained through black markets and from friends in the country. It was this additional supply that made the difference between what could be expected from rationing and the conditions actually existing.

The United Kingdom had serious food difficulties during the war. The health of the people there is better generally than prior to the war because of the rationing program. The dietary was very simple and relatively uninteresting. The important difference between the British and Continental ration was that bread and potatoes were unrationed in Britain. In addition calcium was added to the flour. The British took care of the vulnerable groups and the workers by providing meals outside the ration in local restaurants. There was loss of weight in the United Kingdom as well as in other countries but in this case it was more pronounced in the wealthy class than in the poor which is an indication that rationing was more effective there than in countries where special arrangements were necessary to get additional food or patronize black markets.

A few specific observations on food habits might be interesting. The basic dietary was bread from high extraction flour, potatoes and leafy vegetables. The people of the liberated countries seemed to eat more vegetables than Americans do. They also ate more of the plant, such as leaves and heads of cauliflower and leaves of leeks. The bread and potato consump-

tion in Europe tends to be higher than here. For example, 350 to 800 grams of bread daily and 300 to 500 grams of potatoes daily was consumed in Britain and the same was true in Germany.

A meal at Gregnon Agricultural College, established about 1770, brought out two French characteristics, the tendency to eat foods separately and the use of bread to clean the plate. This latter practice is one explanation of the large quantity of bread they eat.

The meal was in 10 courses, as follows: Two small sardines, tomatoes with vinegar dressing with no fat, liver paste, eggs, hard boiled, with a sauce and with red wine, roast beef, lettuce, sour-sweet custard pie, pears, cheese, coffee and cognac. Bread was used to wipe up the plate after each course and plates were changed with each course. There was a French nutritionist who gave suppers occasionally but the American group did not like his parties because they could not eat enough bread and the other dishes too, to indicate that they enjoyed them. They did, however, like the red wine he served.

Eating in Denmark was a pleasure for they had fresh eggs and beans and bacon. In Liege, Belgium, a professor obtained eggs from his farm 50 kilometers away where he kept 48 hens back in the woods. Officially he had only 12 hens. He was worried about how he could declare them after liberation.

FIFTH SESSION

REGIONAL VS NATIONAL FOOD HABITS AND NUTRITION

Friday, 7 December, 1945

CHAIRMAN
MAJOR VIRGIL O. WODICKA,
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SIGNIFICANT ASPECTS OF REGIONAL FOOD PATTERNS.

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This paper will discuss the specific problem before this conference of how a study of regional food habits may be used as a basis for developing a more acceptable national ration for the Army whose members come from every region in the United States. The methods and recommendations for such studies which have been developed by the Committee on Food Habits of the National Research Council and are now available in published form.(1)

The problem is: the order of information about regional food habits needed so as to use this information as background for planning.

Picture the composition of the Army as men who individually embody a regional food pattern, not only in the actual foods they prefer, in the way they like those foods prepared, in the combinations and sequences in which they prefer to eat them, but also in their attitudes toward food; whether they resent vegetables as unmanly; whether they classify some foods as only fit for animals and so on. Therefore, regional food patterns must be looked at from two points of view; they provide the basic set of acceptances of food on which acceptance of Army food must rest and they provide a set of limitations which Army food patterns must take into account. From a practical standpoint the limitations should be outlined first.

The food attitudes of each region should be analyzed in terms of rejections and types of rejections which exist for food which is accepted in other regions of the United States and which might therefore be expected to be included in a national ration. Even if only one region rejects an item of food, or a method of preparation, individuals from that region scattered throughout the Army, as cooks, mess sergeants, or officers or any individual with a dominant personality may exercise a disproportionate effect upon the acceptance situation in

mass feeding.¹ A regional survey would then provide a list of items of food, methods of preparation, types of food combinations and meals in which certain foods are not acceptable which would give a set of limitations on any national plan. These rejections should not be expressed simply as baked beans or carrots but the specific nature of the rejection, as to whether it was a matter of rejecting food because it was "low class", as is often done with margarine, "animal food", as is done with yellow cornmeal in parts of the south; or classed as food for members of a minority group or for a rejected other region or nationality or religious group, or merely when the food in question was raw, or cooked with tomato sauce, or served for breakfast instead of dinner or supper. If the specific nature of the rejection is known, it will be found in many cases that merely serving the food in another way, or at a different meal, or under some different rubric, as when a food classified in one part of the country as fruit is treated elsewhere as a vegetable, will be sufficient.

When the construction of a diet for a group of people of differing food backgrounds is looked at in this negative way, the emphasis is inevitably upon avoidances, simplifications, choices at points of stress. Early in the war when there seemed, if a city like New York had to be evacuated, a possibility that we might be faced with the problem of feeding large masses of people of different nationality backgrounds, the Committee on Food Habits worked out a report on the subject of such emergency feeding.(2) The principles which were developed, after extensive consultation with experts in the feeding of mixed groups, were:

¹ In an unpublished experiment with feeding a special soup containing soya in school lunches, it was found that the attitude of the servers towards the use of soya had a significant effect upon the school children's acceptance of the soup.

1. Serve foods in as natural a form as possible, without sauces or any seasoning except salt.
2. Avoid combinations of food.
3. Avoid methods of preparation in which the food cannot be identified.
4. Provide as many types of seasoning, condiments, sauces, *et cetera*, in separate form as possible to be applied at the discretion of the eater.
5. Do not cook with milk, but provide milk for drinking.

It will be seen that these recommendations parallel some of the observations presented by Dorothy Dickins yesterday.(3)

Another model for food preparation for individuals from mixed backgrounds is the type of salad found in American cafeterias, where the salad is placed on the plate without dressing and several dressings provided separately. It must, however, be recognized that such salads are inferior to a salad which can be mixed properly, and that similarly a diet which is planned with only negative cautions in mind is likely to have the same lack of character. Later the question of developing a specific character or style for Army diets will be discussed.

If regional food patterns are considered in terms of their strengths rather than their limitations, then a different question arises. Are the vigorous, hearty acceptances of either specific foods, methods of preparation or food combinations, which are characteristic of one or more regions and not counter-indicated for other regions, the basis upon which to build an acceptable Army diet? In such an enquiry acceptances instead of rejections should be looked for and it is necessary to find ways of describing these acceptances so that they can be generalized. For instance buckwheat cakes are a great favorite in one or more regions and not

specifically disliked in any region.² Then buckwheat cakes would have to be described in terms of a variety of attributes, as pancakes, as substitutes for bread and/or as substitutes for breakfast staples such as eggs; they are hot, flannel-like, can be eaten with a sweet syrup or with bacon, sausage, ham; they constitute the *piece de resistance* at breakfast; they are served in piles giving a sense of abundance, can be eaten with a fork. Inspection of these attributes, combined with a knowledge of the breakfast preferences of each region, would show whether it would be possible to use buckwheat cakes in a national pattern or if hot cakes made of some other flour would be better, and with what garnish or companion food the hot cakes would be most acceptable. From this slight illustration it will be seen at once that the information about regional food patterns has to be very full to provide enough background data for constructing a national diet with maximum acceptability.

Such regional information can not confine itself to lists of food, or even lists of dishes, which, as Dr. Dickins has emphasized, are considerably more significant, but must be based on a statement of pattern which includes full menus, snack, and the differences between the expected meal pattern if a meal is eaten at home and the expected pattern if a lunch is carried or a meal eaten in a restaurant away from home.³ Investigations into the food habits of military personnel, such as those made by Dr. Claud McKay into the habits of Navy personnel, have demonstrated that in working out any complete dietary the snack, the food eaten at the PX, must be taken into account. There will be a reciprocal relationship between the foods served in the regular mess and the type of food available in the PX and other sources of snacks, and behind this relationship will lie the attitudes which the men have developed toward

2. This is a purely fictitious illustration as there is not enough information on all regions to choose an illustration which is factually correct. This circumstance alone points up the need for such a study as is now contemplated.

3. Ruth Leverton's data on the contrast between the large hot meal served in rural Nebraska to adults and small children and the meagre cold luncheon carried by the school children, is a case in point here.(4)

food which is dished out to them by someone else as compared with food which the individual sallies forth and buys, as a child takes his first penny to the candy store, or selects himself in raids on the family refrigerator. In making plans for a total dietary such attitudes as which foods and which meals one should be allowed to select oneself, and which meals may legitimately be planned for one, are very important.⁴

In the problem of actual research methods, it may be useful to divide the desired information into two divisions:

1. Information which no one has and which can only be obtained by careful sampling and extensive interviewing of the selected respondents along the lines outlined in yesterday's discussion. An example of such information would be the relative preference in the United States for black or red raspberries, between different types of squash, for string beans as compared with lima beans.
2. Organize and analyze information which already exists but which has never been organized.

Examples are the methods of food preparation common to a region, the foods which have high or low social status in a region, foods characteristically fed to young children, attitudes towards learning to eat, use of food as a method of disciplining children. In each region there are many individuals who know all of these things, among home economics teachers, home demonstration agents, newspaper and

radio commentators on food, food purveyors, restaurant keepers, nurses, social workers and physicians. What is needed to make this information available for the planning of an acceptable national ration is not a sampling of a representative cross-section of the population, but intensive selective interviewing of those individuals in the region who know the facts in question.

If a reliable sample is interviewed for those facts which are not known, the results of such interviewing can be interpreted in the light of this second type of background information. Suppose, for example, that the dish creamed potatoes occurs often and in favor among respondents from the Southeast. The background interpretive information will indicate that creamed potatoes is a term applied to mashed potatoes in parts of this area, and that the mashed potatoes for which a preference is indicated are not the mealy, relatively stiff dry type of mashed potatoes found in the Middle Atlantic States, but a more yielding, more moist preparation. At the same time the background information would show that the term creamed potatoes is applied in other regions to a dish made of boiled potatoes diced and combined with a white sauce, a very different dish indeed. The background material on the food habits of the region, the characteristic nomenclature and methods of preparation, will serve to annotate each item in the intensive interviewing and provide a basis for further more abstract statements.

The first slide which Dr. Faith Fenton showed illustrates the way in which she had asked her taste panel judges to indicate in abstract terms their general preferences in food, and then their specific judgment on the food being tested. The judges were asked to indicate whether or not they liked their vegetables natural color, crisp or soggy, and so on. It will be important finally to reduce the information on regional preferences to terms such as these because out of such descriptions it will be possible to develop a national dietary which will use the preference of one region for natural color in vegetables and of another region for crispness of stewed fruits, as a basis, for example, for serving stewed fruit which keeps

⁴ Some preliminary unpublished surveys placed at the disposal of the Committee on Food Habits showed that a very small proportion of the Americans queried felt that they wanted anyone else to choose their breakfast, but a very large proportion were willing to have theirs planned by someone else. Such attitudes would indicate that efforts to break the monotony of an Army diet would better be concentrated on other meals than breakfast, when no choice could be offered, and that a monotonous breakfast might be accepted provided choice was always offered to each individual.

its color but is also crisp. In this connection it will be necessary to develop a vocabulary which is strictly non-invidious, terms like limp, or soggy, if applied to descriptions of regional foods, are bound to arouse resistance.

Once this data is available on regional food patterns there remains the question of the possible approach to its use. It will be known what foods and what methods of preparation and what combinations must be avoided; and what foods, what methods of preparations and what combinations have the highest acceptance value. The derived national pattern can be stated in an abstract way. Breakfast can be described in terms of a sequence of hot and cold, acid and sweet, liquid and solid, in food catagories such as fruit, breakfast cereal, breakfast dish. From such statements it will be possible to judge whether a tropical fruit like the papaya, for example, available abroad for Army rations, can best become an introductory breakfast fruit or a salad or a cooked vegetable. Such considerations would be taken into account as the greater willingness to accept the same fruit day after day for breakfast; whether new vegetables are scrutinized more than new fruits; whether the cooked papaya fits into a vegetable category, such as squash which has low acceptability, as compared with the fruit category such as melon with a higher acceptability; and whether the papaya can be cooked either crisp or limp, dry or wet. Inspection of the derived national pattern for each meal, for usual meals versus company, Sunday or special meals, for year-round meals as compared with seasonal meals, would give continuing guidance as to the best place and best method of incorporation of new foods, or new methods of food preparation.

However, after this is done, there still remains the problem of whether the mass feeding of men in Army messes is itself to be approached negatively or positively. It is possible to say that mass feeding, and particularly mass feeding under war conditions of transport and combat, is inevitably inferior to home cooking

or even restaurant cooking. Every soldier may be assumed to be regretting bitterly the absence of home cooking and Army feeding can be regarded as a poor substitute at best for all civilian food situations. Or a more positive approach may be that Army feeding is a thing in itself, with certain limitations but also with certain possibilities unrealizable in civilian life. The unstinted abundance which characterized much of the Army feeding in World War II is a positive value and one which human beings can learn to rely on. Certain types of regularity, a given food on a given day of the week, can give security and a sense of the reliability of life, as well as arousing opposition on the grounds of monotony. The high quality of the natural foods which the Army can insist upon using is again a positive value. If, using regional materials as a guide, the Army were to develop a national style of mass feeding, scientifically determined and cut loose from the indifferent traditions of mass feeding which are now one of the principal sources of all mass feeding styles, it might be expected to encounter a much higher level of acceptability. Americans are fully capable of appreciating and liking several styles of food, a certain style in home cooking, a different style in picnicing, a style in snacks eaten standing and a style in restaurant or cafeteria or carried lunch. There is no reason why Army food should not be another style towards which a high positive acceptance could be developed.

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SOME FOOD HABIT STUDIES IN RHODE ISLAND

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The following report will be confined to data and results of two studies made in Rhode Island. The first was a food habit survey conducted in the spring of 1942, and the second a nutrition survey made in January, 1945. In the former an attempt was made to obtain a representative sample of food habit patterns for the entire state and in the latter, a statistically developed sampling method was used in two cities to determine the extent of knowledge and application of nutrition information.

FOOD HABIT SURVEY OF 1942

The food habits of Rhode Island people are probably not greatly different from those in other regions of the country, but early in 1942, as submarine warfare began to make itself felt in the local food markets, the food habits in this area assumed new significance. People interested in food and nutrition programs throughout the state began to voice concern as to how consumers might be helped to meet a rapidly approaching food shortage period. The threat of a rationing program was imminent. Some enforced changes in food consumption were certain to follow and leaders were eager to utilize this time for teaching nutrition information along with the use of food substitutes. Before intelligent aid might be given it was necessary to have certain accurate information about the foods usually selected in Rhode Island.

To meet this need a Food Habit Survey⁽¹⁾ was conducted by the Home Economics Division of the Rhode Island Experiment Station during the last half of April and all of May, 1942. Although this period could not strictly be called a normal time, it had not yet been greatly affected by the events of war and the markets still offered a wide selection of food materials all through the six-week period of the survey.

Reserve stocks in wholesale and retail markets helped to cushion the impact of a sudden drop in food supplies. No food rationing program had been started and the results of this study could be expected to reflect general food selection practices followed during a relatively normal period.

PROCEDURE

The short time which was allowed for the completion of the survey prevented work with single individuals and it was decided to work through organized groups over the state. Such groups afforded contact with large numbers and appeared to be more representative for the state than was otherwise possible under the limiting circumstances. Groups included were home demonstration clubs, parent-teacher associations, Red Cross training classes, students in colleges, secondary school homemaking classes and a few industrial and religious groups. More than half were located in rural areas but some urban groups were included.

An extremely simple questionnaire was developed which might easily be checked by the cooperating individual. The questionnaire was arranged so that the data might be transcribed directly to a Hollerith machine card for tabulating. Information obtained included the nationality of the individual and his parents, the occupation of the family head, the total number in the household and the family status of the person supplying the data. Other information covered the amount of home food production, food purchasing and storage practices, cooking methods and additional food which would be used if cost or availability were of no consideration. The last two pages of the four-page questionnaire provided space for checking all foods and the number of servings consumed by the individual during the 24-hour period.

immediately preceding the recording of data. The food record was scored by the use of standard measurements.(2)

RESULTS AND DISCUSSION

Completed records were obtained from 1,617 persons, of which 896 lived in rural and 721 in urban communities. Most of these people were born in the United States, only eight percent being foreign born. By far the greatest number of foreign born in each case reported the British Isles and Canada as their birthplace. Approximately two-thirds of their parents were native born. Ninety-five percent of the cooperators were women or girls as it was extremely difficult to reach groups of men during the time allowed. The 1940 census for Rhode Island reports 21 percent as foreign born, so this sample with only eight percent cannot be considered entirely representative for the state, but probably more nearly represents the food habits of the native-born white female population.

When comparing the size of the household with the 1940 census, a better relationship may be found. The percentage figures in each group are nearly identical for both reports. Another indication that the sampling method did not supply data to follow the census report was found in the occupational status of the head of the family. The group represented a larger proportion of skilled and profession-trained heads of families than was to be found in the census data. This coupled with the fact that all of the individuals were associated with an organized educational, civic, fraternal, or social group indicates that the intellectual level might have been higher than for the state as a whole.

The records were supplied by homemakers in 54 percent of the cases and 28 percent additional were filled by an adult female. Only five percent of the records were given by a male member of the household.

After scoring the daily food consumption records, it was found that the individual dietary scores covered a wide range, with some falling as low as 20 percent of adequate and 9 percent rising to the fully adequate diet, or rated 100 percent. The average for all the individuals

was 85 percent. Protein foods, including meat, eggs and dried legumes, were used in more nearly adequate proportions than all other types of food. Seventy-four percent reported fully adequate use of these foods and an additional 24 percent reported the use of three-fourths enough. The use of vegetables was next with 66 percent reporting an adequate use of vegetables and 17 percent using vegetables up to three-fourths of adequacy. Whole grain or enriched cereal products and fruit followed next in order with 58 percent using adequate amounts of the former and 56 percent of the latter. Milk was used in the least adequate proportions of all the different types of food with only 39 percent adequate use being reported. Although some use of milk frequently appeared in the daily records the amount tended to be small.

The use of milk was the only food which gave a direct correlation to the diet rating. The average score for the group which used no milk was 65 percent, while those using one-half pint of milk during the day showed an average score of 75 percent. When three-fourths of a pint of milk was used daily the average score was raised to 85 percent and the use of a full pint of milk daily supported an average record of 90 percent. For those using more than a pint of milk daily an average score of 95 percent resulted. From these results it is shown that a progressive improvement in the dietary scores was obtained with the increased consumption of milk.

Although the dietary ratings are of interest in ascertaining the value of diets, they do not throw as much light on food habit patterns as may be found in the use of different foods selected by individuals to make up the whole diet. In Table I there is listed the different foods used by the 1,617 individuals and the number of servings for each, as shown in the day's food record. Under the classification of protein foods it was found that milk, eggs and beef were most frequently used and that veal, the organ meats, dried beans and peas were least used. Citrus fruits were used more often than other types of fruit but this may have been due to the season of the year when the data were collected. Of the vegetables, potatoes were

the most popular with lettuce and tomatoes following as second and third choice. The most universally used article of food was butter with only two percent reporting any use of margarine. About two-thirds of the individuals used sugar in quantities varying from one to nine

teaspoonsful a day. Other sweets such as honey and molasses were little used. The favorite dessert was cake while pie and ice cream were next in close succession. Coffee was the favorite beverage and may have been responsible for crowding some milk out of the diet.

TABLE I

The Number Of Servings And The Variety Of Food Used By 1,617 Persons On The Day Reported In
The 1942 Rhode Island Food Habit Survey

Food Item	Use One Serving Daily	Use Two Servings Daily	Use Three Servings Daily	Use Four Servings Daily	Used None
	Percent	Percent	Percent	Percent	Percent
Protein Foods					
Milk-----	35	35	4	8	18
Cheese-----	26	3	0	0	71
Eggs-----	40	7	0	0	53
Beef-----	36	5	1	0	58
Pork-----	22	4	0	0	74
Veal-----	2	1	0	0	97
Lamb-----	11	3	0	0	86
Poultry-----	13	2	0	0	85
Organ Meat-----	5	1	0	0	94
Fish-----	11	1	0	0	88
Dried Beans-----	9	2	0	0	89
Fruits					
Oranges, etc-----	56	16	3	0	25
Bananas-----	8	1	0	0	91
Apples-----	20	4	1	0	75
Dried Fruit-----	7	1	0	0	92
Any Other-----	25	3	1	0	71
Vegetables					
Potato-----	64	14	1	0	21
Sweet Potato-----	5	0	0	0	95
Lettuce-----	43	11	1	0	45
Spinach-----	13	2	0	0	85
Other Greens-----	21	4	1	0	74
Corn-----	7	1	0	0	92
Carrots-----	29	3	0	0	68
Other Yellow-----	9	1	0	0	90
Tomato-----	36	6	0	0	59
Any Other-----	37	12	2	0	49
Cereal Foods					
Bread					
Whole Grain-----	19	18	7	2	54
Enriched-----	16	13	6	3	63
White-----	13	11	5	1	70
Corn-----	4	2	0	0	94
Hot Rolls, etc-----	7	2	0	0	91
Waffles, etc-----	4	1	0	0	95
Breakfast Cereal					
Whole Grain-----	14	0	0	0	86
Refined-----	3	0	0	0	97
Macaroni-----	10	1	0	0	89

TABLE I (Continued)

Food Item	Use One Serving Daily	Use Two Servings Daily	Use Three Servings Daily	Use Four Servings Daily	Used None
	Percent	Percent	Percent	Percent	Percent
Fats					
Butter-----	17	23	39	8	13
Cream-----	30	17	5	1	47
Margarine-----	1	0	1	0	98
Bacon-----	20	2	0	0	78
Sweets					
Sugar-----	15	19	14	17	35
Honey-----	6	1	0	0	93
Molasses-----	2	0	0	0	98
Cake-----	42	18	4	0	36
Pie-----	24	2	0	0	74
Ice Cream-----	21	3	0	0	76
Other Dessert-----	29	4	0	0	67
Soups					
Meat-----	6	1	0	0	93
Milk-----	6	1	0	0	93
Vegetable-----	12	1	0	0	87
Beverages					
Tea-----	28	17	3	1	51
Coffee-----	37	28	8	4	23
Cocoa-----	8	1	0	0	91
Soft Drinks-----	10	4	2	0	84
Miscellaneous					
Jelly-----	21	3	1	0	75
Pickles-----	18	2	1	0	79
Cod Liver Oil-----	1	1	0	0	98

Nutrition instruction has long emphasized the importance of milk in the diet and cost has usually been given as the reason for preventing a wider use. From the results of this study it appears that taste and habit rather than cost determine the use of milk. In answering a question as to what drinks would be used in larger amounts if the cost were not to be considered, only one-third of the group said they would use more milk; 17 percent said they would like more mixed drinks made with milk and eight percent would use more coffee.

RHODE ISLAND NUTRITION SURVEY IN 1945

During the first week of January, 1945, the Rhode Island Nutrition Council, with the help of several federal and state agencies, conducted a pilot type nutrition survey. This investigation was designed to study a survey method and to

obtain certain information as to the effectiveness of the wartime nutrition programs. The plan was developed for the Nutrition Programs Branch of the War Food Administration by the Division of Program Surveys, Bureau of Agricultural Economics, United States Department of Agriculture.(3) Should the method prove practicable for use by nutrition councils throughout the United States, a nationwide survey could be conducted under the sponsorship of the nutrition branches of the War Food Administration.

The two cities selected for the trial study were Providence and Central Falls.

PROCEDURE

The cities were divided into areas by the use of the mathematical plan recommended by the Bureau of Agricultural Economics. After the

sample blocks were located dwelling units within the block were designated. Two definitely specified alternates were allowed to be used in case the first or second choice failed to supply data. When data could not be gathered from either of the three dwelling units this block was temporarily omitted and another plan was worked out for that block. On the basis of this carefully developed sampling method it was assumed that one hundred schedules would yield representative data for a given area. Thus the sampling plan was set up to collect 100 schedules in each of the two cities.

Field workers, who collected all of the schedules were composed of the seven Regional Supervisors of Nutrition Programs under the War Food Administration, representing all areas of the United States and an equal number of trained nutrition workers in Rhode Island. The field workers spent two days in each city and collected most of the schedules within that time. The few which remained were picked up within the following few days so that the entire study was completed in about a week, thus eliminating changes in the markets or seasonal differences.

A Rhode Island extension nutrition specialist planned the program of work and instructed the field workers. This insured a high degree of uniformity throughout. This person also checked the schedules when the field workers went out and again when they were completed. The schedules were then passed on to another person trained in the use of the Hollerith tabulating system. The data were not applied to cards but were assembled on regulation code sheets from which the results were calculated.

RESULTS AND DISCUSSION

The results reported in a mimeographed leaflet (4) indicate that the aims of the original plan were attained. It was shown that 68 percent of the Providence families were able to recognize and make good substitutions within the basic seven foods while 48 percent did so in Central Falls. It was found that education had considerable influence upon the knowledge of the basic foods.

Breakfasts were also emphasized in the war nutrition programs and information was gathered concerning the breakfasts of families and children. It was found that in both Providence and Central Falls very few people went without breakfast. However, the schedule as arranged did not allow for adequate listing of foods and the information obtained did not afford sufficient data to yield other worthwhile results.

Another shortcoming of the schedule was that only one item was included which could be correlated with census reports to give some clue as the valid coverage of the area studied. This item was the designation of the color of the race to which the individual belonged. In Providence 99 percent white respondents were reported and only one percent Negro, while Central Falls reported 100 percent white respondents. This follows the 1940 Census for Rhode Island, with Providence reporting one percent Negro population and none in Central Falls. From this meager evidence it appears that this sampling method might prove satisfactory.

CONCLUSIONS

These two studies were selected to illustrate widely different sampling methods for collecting somewhat similar information. There are advantages and disadvantages to be found with each method. The first sacrificed an opportunity to obtain a cross-section sample of the population so that one research worker might contact large numbers of individuals within a relatively short time. The second employed the use of large personnel for a brief period and was able to supply promptly the desired information. If the latter schedule might have been changed to include a wider range of information with some means introduced to evaluate the representative qualities of the sample, then the method appears to have definite merit.

A third method which has been used for studying food habits in some regions of the country has not been used in Rhode Island although it does offer another approach. Such a method involves longer time than either of

the two methods here reported since it is designed to determine variations within the food habit patterns.

When determining methods for making a specific study there appears to be three major factors which will directly influence the method selection. First there must be a clear-cut understanding of just what information is desired. Second the time period which can be allowed for obtaining the results and third the available personnel for doing the various phases of the research. With these major items established, then a method may be chosen which best adapts itself to the requirements.

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FOOD CONSUMPTION PATTERNS IN RURAL SOUTH CAROLINA AND THEIR NUTRITIONAL SIGNIFICANCE

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On going to South Carolina, after living in several states of the North and Middle West, one is struck by certain differences in the foods commonly served. The newcomer is unfamiliar with hominy grits and with rice served as a vegetable and may wish for mashed potatoes and gravy instead. The pale yellow sweet potato often seen in Northern markets has not prepared one for the deep yellow, soft, sweet Porto Rico and Nancy Hall varieties which are frequently made even sweeter by cooking in sugar or sirup, as in candied or glazed sweet potatoes. The delicious sweet potato custard pudding and the pie, much like pumpkin pie, are accepted readily. One begins to appreciate plain baked sweet potatoes on seeing rural children just home from school take them from the ashes of the hearth or from the oven of the kitchen range and eat them with gusto. Perhaps they have carried one or more to school to eat for lunch with the sausage-and-biscuit sandwich made up for them from the breakfast table.

Vegetables previously known to the newcomer more by report than actual experience include okra, collards, turnip greens, mustard and other greens, egg plant, summer squash, and field peas, such as Crowder peas, which are eaten in the immature stage as well as dried. Some vegetables more familiar in other parts of the country than in South Carolina, at least in rural districts, are carrots, spinach, parsnips, salsify, cauliflower, celery, asparagus and pumpkin. Studies among farm families in South Carolina have shown that green string beans, dried beans, butter or lima beans both green and dried, green field peas, dried black-eyed peas, okra, tomatoes, corn, cabbage, onions, turnips and various greens are the

great vegetable standbys of the diet. Irish potatoes are in somewhat the same category as the other vegetables and not the year-round staple they appear to be in some other sections of the country. When the newcomer finds himself actually liking young okra pods, well cooked but without tomatoes or other accompaniment, he may claim to have passed a gastronomic milestone. Vegetables cooked for several hours with pork, usually fat salt pork, may continue to seem monotonous and even unappetizing when the grease is too plentiful, and there may still be, after some years of residence, little sympathy with the enthusiasm of the young woman who says she could write a poem about good old hominy grits.

Other food rather distinctive of the region includes fresh sweet figs and delicious freestone peaches from both of which preserves are often made; peanuts eaten raw, roasted, or boiled in the shell while in the milky stage; pecans salted, or used in a variety of candies, cakes and pies; and, of course, watermelons and muskmelons in abundance during a short season.

Everyone is familiar with the South's preference for hot breads. In most farming communities in South Carolina the traditional daily schedule calls for hot biscuits for breakfast, cornbread or cornbread and biscuits for dinner, and cornbread, hot or cold, for supper. Cornbread is almost always served with boiled vegetables. Baker's bread from the store is being used increasingly, even by farm families, especially when toasted or made into sandwiches, but there is still little liking for cold loaf bread served with a meal. Hot rolls have always been well liked but in general they are made only for

special occasions. Sweet rolls, sweet crackers, and other sweet bakery products are regarded as real treats.

White cornmeal and grits are preferred to the yellow variety in most South Carolina communities. Many pounds of yellow meal and grits were fed to hogs and chickens during the 1930's by families receiving surplus commodities from the Department of Public Welfare.

The observer, with tales of the midwest pioneer days in mind, has little difficulty in recognizing in rural South Carolina the traces of a pioneer diet which must have been common to the settlers in various parts of the country who lived far from populous market centers. Cornmeal and hominy, home-made sirup, cured pork, dried beans and sauerkraut were foods easily provided by the isolated farmer. Later additions were white flour, eggs, poultry, cane sugar, a rather limited variety of vegetables and fruits, and milk and butter. Vance(8) points out that the conditions of Southern frontier life led to the use of salt pork, corn and molasses as staples, first by the settlers and later by the plantation slaves. The ration for the latter on many plantations was a weekly allowance for each slave of three pounds of pork, a peck of corn, a pint of salt and molasses in proportion. Sweet potatoes might also be issued. Traces of this ration are evident still in the food plans of the less privileged Negro families in rural areas.

Certainly the old order is changing, in foods as well as in other ways. School lunches, which often utilize commodities shipped in from other regions, have introduced some foods not very familiar to rural children, who are learning to accept them, still rather consciously as good for them rather than just good to eat. Carrots, spinach, grapefruit and canned grapefruit juice definitely belong in this category. Through the influence of various educational agencies farm families also are changing certain well established habits of food production and use. This discussion will pay most attention to the dietary patterns found among rural families of low or moderate incomes, probably the most conservative of all groups in the state in regard to dietary practices.

FARM FOOD SUPPLIES IN PIEDMONT AND LOWER COASTAL PLAINS

Food consumption studies among farm families in two contrasting areas of South Carolina (2) (3) have shown that the food pattern in the Piedmont region differs in certain respects from that in the Coastal Plains. In the Piedmont, an area settled by small farmers, there is a high degree of self-sufficiency in family living, especially in regard to the food supply. Most families raise corn for food and feed and wheat for flour, all but the poorest have one or more cows, feed at least one hog for butchering, keep some poultry, and raise sweet potatoes and other vegetables for home use. Cornbread, biscuit made of white flour, sweet milk or buttermilk to drink, and enough pork to season boiled vegetables and to provide gravy for the breakfast hominy are the common everyday foods of ordinary farm families in this section of the state.

In the lower Coastal Plains of South Carolina farm families eat much more meat, seafood, and rice, and much less milk than do those in the Piedmont, and they buy a greater proportion of the food supply. Milk is not easy to produce where acid soils make permanent pastures difficult to maintain. Nor is it easy to keep milk sweet in the humid hot climate. In some counties only about one-third of the farm families keep cows and a good many who do have their own milk drink very little, though they use cream and butter. There is decidedly less liking for milk to drink than is found in the Piedmont. On the other hand, hogs can be fed readily in the low country, probably because the yield of corn is higher there. Pork, both lean and fat, forms an important part of the diet among owners and the more stable tenant families.

In the Piedmont, home-made sirup is derived from sorghum, while in the Coastal Plains it is usually made from sugar cane. In both sections rural families buy the various commercial sirups as a spread for bread if they make no sirup.

The increase in consumption of rice as one approaches the coast is striking. It is one of the

staple articles of diet, eaten with meat gravy, combined with shell fish, chicken, or tomatoes to form a pilau, or eaten with blackeyed peas that have been cooked with fat meat. The latter, known as Hopping John, is a traditional New Year's dish. Apparently rice is not a breakfast dish in the low country, as it may be in the Piedmont. Families in the lower Coastal Plains often cook hominy grits for breakfast and for supper as well when rice is not served.

The contrast between the Piedmont and the Coastal Plains may be seen in Table I, which gives estimated per capita consumption of foods in a year among the white farm families studied who had low-cost diets.(4)

TABLE I

Estimated Per Capita Quantities Of Foods Consumed In A Year By South Carolina Farm Families Whose Diets Were Classified As Low-Cost.*

Foods	Unit	Piedmont	Lower Coastal Plains
Milk	Quarts	272	128
Eggs	Dozens	11.8	11.3
Lean meats, poultry, fish	Pounds	52	88
Dried peas, beans, nuts	"	14.2	13.5
Irish potatoes	"	25	31
Sweet potatoes	"	74	74
Leafy, green, and yellow vegetables	"	78	62
Tomatoes and citrus fruits	"	18	31
Other vegetables	"	40	37
Other fruits	"	110	98
Flour (largely refined white)	"	143	116
Cornmeal, grits	"	83	69
Rice	"	3	51
Other grain products	"	2	1
Bacon, other fat pork, lard	"	37	46
Other fats (exclusive of butter)	"	1	2
Sugar	"	39	41
Sirups, honey, preserves, etc.	"	28	23

* Source: S. C. Agr. Expt. Sta. Bul. 343. Low-cost diets were those having a per capita weekly retail money value of less than \$1.80 at average price levels in 1935-39.

Negro families in the Lower Coastal Plains used more cereal foods than did white families, largely because of greater consumption of cornmeal, grits and rice. The estimated average consumption of rice among Negro farm families studied was about 73 pounds per person in a year, an amount almost 50 percent higher than the figure given above for white families in that section of the state.

FOOD CONSUMPTION IN THE SOUTHEAST COMPARED WITH THAT IN OTHER REGIONS

The food consumption pattern of rural South Carolina families, as shown by experiment station studies, is similar to that found in the Southeast by the Consumer Purchases study of 1934-36. The Bureau of Home Economics, which was responsible for the study in rural areas throughout the country, found that at a given level of money value of food, or for a given income class, families on farms and in villages and small towns had available for use more flour and other grain products and more fats than did those in other regions(6). A higher proportion of the total was in the form of flour, meal and grits. The figures as given probably over-estimate actual consumption in the Southeast where in rural families much of the cornmeal and grits on hand or prepared may be fed to poultry and dogs. The study also indicated that use of potatoes, white and sweet together, was less in the Southeast than elsewhere, but that more sweet potatoes were used than in other regions. Only families in the Pacific states had as high an average consumption of green, leafy and yellow vegetables as did those in the Southeast.

The South Carolina Experiment Station has made no studies in the villages and towns of the state, but observation of markets and purchases would indicate that while residents of the larger towns have access to and probably consume a greater variety of vegetables and fruits than do rural families, use more yeast bread and other baked goods, and buy a greater variety of meats and other foods, there is still a tendency to keep to the regional food patterns established largely by a rural culture.

In 1933 the United States Public Health Service included in a study of the diets of low-income families several cotton-mill villages in South Carolina. Wiehl(9) comments on the large quantities of flour, cornmeal, lard, salt pork and sugar used by families of every income level in these villages. Somewhat similar findings were reported for Birmingham. In both of these industrial areas the quantity of milk used was low except by the mill-village families who had cows.

Reports by the Bureau of Labor Statistics(1) on the portions of the Consumer Purchases Study made in large urban communities give certain details as to use of foods not available elsewhere. For example, the figures on food purchases for September through November among families with annual incomes of \$1000 to \$1499 show that both the Negro and white families in three cities of the Southeast had less milk, much more bacon and fat salt pork, fewer white potatoes and more sweet potatoes, and much greater quantities of cornmeal and rice than did those in other regions. In South-eastern cities more families bought green string beans and fewer used carrots and spinach than was true of families in other regions. Turnip greens, collards and some other vegetables common in the South were not listed in the table.

An interesting light is thrown on differences in the use of foods among urban families in various parts of the South by another of the reports on the Consumer Purchases Study(10). Data for 12 cities are included: Baltimore, Birmingham, Dallas, Houston, Jackson, Jacksonville, Louisville, Memphis, Mobile, New Orleans, Norfolk-Portsmouth, and Richmond. Rice consumption was highest in New Orleans and relatively low in Baltimore, Louisville, Richmond, Dallas, and Memphis. In all but one city the Negro families studied used more rice, cornmeal and grits than did white families. In Baltimore, Houston, Dallas, and New Orleans relatively small quantities of cornmeal and grits were used as compared to cities of the South-east.

SUPPLY OF NUTRIENTS IN RELATION TO DIETARY PATTERNS

Studies in South Carolina rural areas during the decade 1930-1939 indicate that a rather high proportion of farm families, perhaps as many as one-third the white and one half the Negro families, had diets which provided one or more of the important nutrients at a level below that now thought to be a minimum for nutritional safety. Whether the standard used in evaluating these food records is too high cannot be established definitely, but there can be no doubt that by almost any accepted criterion many of the diets were far from being adequate in nutritional values.

South Carolina farm family diets were frequently found to be low in ascorbic acid except in summer, when melons, tomatoes, and other fresh fruits and vegetables were plentiful. This was particularly true of low-cost diets. In medium-cost diets there were more fruits and vegetables and especially more citrus fruits and tomatoes. Apparently Vitamin A values were well supplied except during mid-summer when neither sweet potatoes nor leafy greens, the chief sources of this nutrient, were used to any great extent. These deductions from food consumption studies are supported by the results of analyses for ascorbic acid and Vitamin A values of the blood of two small groups of elementary school children in a rural area in the upper Piedmont(5). In early December and in April relatively few of the children had low Vitamin A values¹. That is, less than 60 I. U. per 100 cc. of blood. On the other hand, ascorbic acid values were often below 0.4 mg. per 100 cc. of plasma, even among the group receiving a well-planned school lunch. This finding was especially marked at the April examination. Only in early September did a majority of the children examined have reasonably good plasma ascorbic acid values. At the April testing of 31 children from a school where no lunch was served it was found that 18 had ascorbic acid values of less than 0.4 mg. per 100 cc. of plasma.

Calculations of the nutritive values of farm family diets in the state indicated that the supply of thiamin and riboflavin was not well safeguarded, especially in low-cost diets, a classification which included most of the diets secured from Negro households. The riboflavin content depended largely upon the supply of milk. Therefore, the Piedmont families were better off in this respect than were those of the lower Coastal Plains. Whole cornmeal, still used by most farm families in the state, supplied a fair proportion of the thiamin in these diets and in the low country lean pork was an important source. The use of enriched white bread and white flour, and now of enriched degerminated cornmeal and grits, is

¹ E. J. Lease and J. H. Mitchell of the Chemistry Department were responsible for the laboratory tests made in connection with the study.

adding significant amounts of iron, thiamin, riboflavin, and niacin to the diets of many families in the state.

That the anti-pellagra factor or factors, has been deficient in the food of many low-income families is attested by the presence of pellagra. The incidence and severity of this disease are decreasing but mild and sub-clinical forms are still sufficiently prevalent to constitute a public health problem. Its association, as an endemic disease, with consumption of corn products is about to be explained, apparently, but there is no time here for discussion of the recent findings in this field.

When the use of both milk and lean meats is very low there is, no doubt, a problem of the adequacy of the protein supply. Among families using only small amounts of milk, as in the lower Coastal Plains, a calcium deficiency would appear more frequently than the dietary calculations now indicate if self-rising flour were not so commonly used. It contains monocalcium phosphate in sufficient amounts to add appreciably to the calcium and phosphorus content of the dietaries. However, with young children this seems a broken reed, dietetically speaking, for not enough bread can be eaten as part of a well-planned diet to provide the calcium needed for growth.

MALNUTRITION IN RELATION TO THE FOOD SUPPLY

South Carolina has little direct evidence of a specific relationship between the nutritional condition of the population and dietary patterns. A recent small-scale study⁽⁵⁾ among elementary school children in the upper Piedmont is, however, suggestive of such a relationship. Most of these children came from homes where a meagre, self-sufficing agriculture provided the chief source of income. The food supply was typical of low-cost diets found in a previous study of Piedmont farm families. The report cited above sums up observations on the physical condition and growth of the children as follows: "One of the interesting aspects of the study was the discovery that most of the elementary school children in the two rural Piedmont districts were well below the American average in height and weight for age. In

growth status and in hemoglobin levels most of the children were also below the averages found in a college community not more than 20 miles away. Judged by height for age and by hemoglobin values, school children in an industrial community and in two rural communities in the Sandhills were fully as much below these standards as were children of the two cooperation schools. Apparently many children in the state are retarded in physical growth and have a tendency toward anemia. This conclusion is borne out by observations made by the South Carolina State Board of Health."

The fact that children receiving a good school lunch made greater gains in height during the period of observation than did those in the control school suggests that an inadequate diet was an important cause of retarded growth among these children.

It should be emphasized that the South-eastern regional diet has in it many valuable nutritional elements and that it is the restrictions imposed by low incomes and insufficient education that have made it almost a synonym for inadequacy. It is capable of decided improvement without changing established habits to any great extent.

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WHAT NEBRASKANS EAT.

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INTRODUCTION

The food habits of Nebraskans are similar to those of other folks for here as elsewhere the food pattern is a composite of influences such as family custom and occupation, personal temperament and the availability and cost of food. Nebraskans, like other people of the Midwest or Great Plains area, demonstrate less blatant regionalism in their food habits than do natives of other sections of the United States. Some sections such as New England or the South were comparatively isolated during the period of their settlement and thus were forced to develop practices of self-sufficiency. Many of these practices have been perpetuated because of the homogeneity of the population. Unlike these sections the Midwest and Nebraska in particular, have never been isolated; they are proud of having followed the railroads across the continent. In addition, the settlers were of many different backgrounds and mingled to establish the present heterogeneous population.

Probably the outstanding characteristic of Nebraska fare is best denoted by such terms as bountiful service, tables groaning under the weight of food, unlimited variety, three of every kind of food. Setting a good table is the keynote of a homemaker's social position. This ideal of abundance or philosophy of fullness arises from

the fact that even though the farms may fail to make any cash return the people may have plenty to eat because they can raise it. This capacity to produce food is by no means limited to the farm population. In the villages and towns and even in the few cities in Nebraska there is hardly a family which cannot make contact with some plot of ground and raise some of its food supply. Thus home production offers tremendous potentialities for nutritional well-being of Nebraskans.

This standard of plenty does not mean that food selection is always wise or that quantity substitutes for quality and balance. The results of several recent studies in the state show the need for improving the food habits of Nebraskans.

STUDIES OF FOOD CONSUMPTION HABITS

Elementary School Children in Rural Areas

In November 1944, 700 children in 70 schools in five counties in the state recorded the foods they ate for five consecutive days. The results were tabulated according to the total number of servings of each of the group of the Basic seven, except the last two groups, cereal products and table fat.(1)

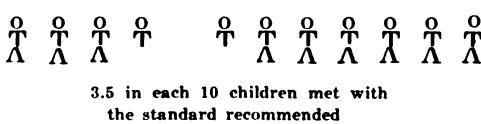
RESULT OF DIET SURVEY

For Good Nutrition

Group I
Green and Yellow Vegetables
1 serving a day



Group II
Tomatoes and Citrus Fruits
1 serving a day



RESULT OF DIET SURVEY

(Continued)

For Good Nutrition

Groups I, II, III

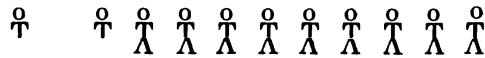
All Fruits and Vegetables
5 servings a day



1.5 in each 10 children met with
the standard recommended

Group IV

Milk
4 cups a day for children



0.5 in each 10 children met with
the standard recommended

Group V

Meat, Poultry, Fish, and
Legumes
2 generous servings a day



5.5 in each 10 children met with
the standard recommended

The results show serious deficiencies in milk, fruits, vegetables and foods rich in protein. Another record made in April showed fewer servings of vegetables and fruits than in November. This is undoubtedly a reflection of the depleted stocks of home canned and stored food supplies.

Records have just been obtained from 6,000 children in the Omaha schools and preliminary review indicates the same deficiencies as shown for the rural children.

College Girls

During the school year 1941-1942 and 1942-1943 records were kept of the food consumption of college girls who were living in a cooperative dormitory and planning and preparing self-chosen diets. The quantities used for each girl for a week were compared with the allowance recommended by the Bureau of Home Economics for a low cost adequate diet for girls 16 to 20 years old (2) (3).

FOOD GROUPS	PERCENTAGE OF RECOMMENDED	
	AMOUNTS USED 1941-42	1942-43
Milk and cheese	75	82
Potatoes, sweet potatoes	43	48
Dried beans, peas, nuts	46	54
Tomatoes, citrus fruits	118	129
Leafy, green or yellow vegetables	63	57
Other vegetables and fruits	114	137
Eggs	66	74
Lean, meat, poultry, fish	66	79
Flour, cereals	68	79
Fats	83	92
Sugars	114	108

Each year in the beginning course in Food Preparation each student keeps a record of food consumption for one week.(4) Summary of these records for many years indicates a low consumption of eggs and a greater consumption of potatoes than by similar students in neighboring states.

FOOD LIKES OF COLLEGE FRESHMEN

In one of the orientation lectures during Freshmen Week at the University of Nebraska, September, 1943, 110 girls and 56 boys were asked to check a questionnaire regarding their food likes(5). On the questionnaire were listed 50 foods, opposite which were four columns headed "Willing to Eat Often", "Willing to Eat Once a Week", "Unwilling to Eat", and "Have Never Tasted (to my knowledge)". Each student was asked to check the column which most nearly described his feeling about each food. The questionnaire was not designed to include all common foods (white bread, ordinary meats, desserts and sweets were omitted), but mainly those which were low-cost and good nutritive bargains, such as skim milk and white potatoes, foods about which there were definite prejudices such as kidney, brains, margarine and the most common vegetables and fruits.

The results were calculated in terms of the percentage of students that checked each food as "Willing to Eat Often", "Willing to Eat Once a Week", "Unwilling to Eat", and "Have Never Tasted".

The most pertinent findings include:

1. There was no one food that *all the boys* and *all the girls* were willing to eat often.
2. All the boys were willing to drink whole milk often but only 84 percent of the girls expressed such willingness.
3. The five foods that the greatest number of boys were willing to eat often were: milk, white potatoes, whole wheat bread, green peas and apples; whereas the greatest number of girls were willing to eat often: apples, oranges, raw tomatoes, leaf lettuce and whole wheat bread.

This tendency for the girls to prefer the fruits and vegetables or foods high in cellulose, whereas the boys preferred the foods higher in energy persisted throughout the answers. As an example, 20 percent of the girls but only five percent of the boys were unwilling to eat oatmeal.
4. The boys agreed with the girls on the four vegetables they liked best: white potatoes, green peas, raw tomatoes and leaf lettuce, but fifth in popularity was green beans for the boys and carrots for the girls.
5. The foods most frequently checked by the boys as "Unwilling to Eat" were buttermilk, parsnips, turnips, kidney and tongue and the girls checked buttermilk, squash, turnips, kidney and margarine.
6. Unwillingness to eat margarine was expressed by 27 percent of the boys and 37 percent of the girls; 20 percent of the boys and 12 percent of the girls were willing to eat it often; and 21 percent of the boys and girls said that they had never tasted margarine to their knowledge.
7. Nine percent of the boys and 20 percent of the girls were unwilling to drink skim milk.
8. Only four percent of either boys or girls were unwilling to eat eggs.
9. Of the boys eight percent checked no foods that they were unwilling to eat, as compared with four percent of the girls. There were 15 percent of the boys and 25 percent of the girls who checked more than 10 foods which they were unwilling to eat.
10. Twenty-two percent of both boys and girls expressed unwillingness to eat spinach and liver, and only 45 percent were willing to eat them often.
11. The same foods, kidney, brains, rutabaga and margarine were checked most frequently as "Have Never Tasted" by the boys and girls. The percentage of students who had never tasted these foods ranged from 21 percent for margarine to 45 percent for kidney. Eighty-eight percent of the students checked less than six foods that they had never tasted.

SUMMARY

Nebraskans have had less need and opportunity to develop so-called typical food habits than people in sections which were more isolated and had a more homogenous population.

The capacity for home production of food in Nebraska has great nutritional and economic potentialities.

Dietary surveys of elementary school children show a low consumption of milk, fruits and vegetables, and foods rich in protein. Dietary surveys of college girls show a low consumption of potatoes, even though higher than for neighboring states, legumes, green and yellow vegetables, eggs and meat.

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A STUDY OF FOOD HABITS IN SEVERAL TEXAS COMMUNITIES

by DR. ERCEL S. EPPRIGHT,¹ *Iowa State College, Ames, Iowa.*

In the course of several dietary studies made of families mainly in North Texas, scattered observations have been made concerning the food habits of the people. The first study of 26 low-income farm families in Denton County included a record of all the food used by these families during one winter month of 1938. The diets were very monotonous. Little initiative or imagination was shown in planning and preparing the meals. The people seemed contented to use the same food day after day. The records included large quantities of white flour, white cornmeal, sugar, compound and Irish potatoes; white biscuits were often eaten three times a day. No whole wheat flour or baker's bread was recorded as used by these families during the month. Rather than scatter the consumption of fresh or canned meat, or canned vegetables over a long period of time and thus give variety to the menus, large quantities of one article were used until the supply was exhausted. After a hog or beef had been killed, exorbitant quantities were eaten while later none was to be had.

Despite the seemingly large emphasis on cereal foods, the distribution of calories was similar to that usually given for American diets:

Percentage of Calories Derived From

	Carbohydrates percent	Fat percent	Protein percent
Average American	55	31	14
Denton	52	36	11

The percentage of protein from animal sources for the 26 Denton County families varied from 5.8 to 68.6 with an average of 45.9.

¹ Contributors to the acceptance studies used in this paper are: Mrs. Charlotte Kyle Clarke, Miss Agnes Gryche, Mrs. Sue Lindley Driskill, Miss Lillie Mae Armstrong, Miss Martha W. Buttrill, Miss Ruby Wilson, Miss Frances Long, Miss Katie McCluney and Mrs. Mary Dale Saunders.

Pork was used in much larger quantities than beef; the ratio was approximately four to one. Very little fruit was used, and the vegetables consisted briefly of Irish potatoes and dried legumes. Large quantities of dairy products and eggs were used by some of the families.

The following year a similar study was made of 39 rural families on a somewhat higher economic level. The distribution of calories among the three food stuffs was approximately the same but the diets were more varied. Approximately 20 times as much poultry, beef and pork were used as fish. The ratio was 21 to one. Over 50 times as much of the former were used as was glandular meats, ratio 53 to one. Eggs were used at the rate of at least one for each person each day, and there seemed to be a tendency for families who were more careless about their meal planning to use eggs more freely. About half of the families used no cheese. All the families used Irish potatoes while only about four-fifths used sweet potatoes. The number of vegetables listed ranged from five to 22. The fruits varied from three to 15. As with the preceding group little whole grain cereal was used.

In 1943 records of one week's food consumption were obtained from 24 mill families in Waco, Texas. These were supplemented by a detailed questionnaire regarding food habits given each homemaker in a personal interview by the investigator.

Seventy-two percent of the family members consumed from one pint to one quart of milk daily; 20 percent consumed a small glass of milk a day and four percent consumed none. Potatoes were used frequently and the favorite method was creaming or mashing; 88 percent served most of their vegetables boiled.

Fifty-two percent of the families preferred and ate round steak, beef, pork roast and ham. Six percent of the families served liver once a

week; only eight percent never served it. The unpopularity of heart and kidney was shown by the fact that 88 percent never served it. Two-thirds of the families never served brains.

Oatmeal was the favorite cereal with toasted corn flakes second. Seventy-two percent thought that they could differentiate between whole grain and refined cereals but their listing of whole grain cereals revealed that most of them were incorrect in their ideas; white rice, beans, cream of wheat, grapenuts and white bread were listed as whole grain cereals. Ninety-two percent of the families served cereals other than bread at least once a day. White cornmeal was used much more frequently than yellow.

In 1942 a fairly detailed study of food practices with references to cereals and attitudes toward them was made. One hundred families in Denton and Smith Counties were included. A questionnaire was presented to the homemaker by the graduate student carrying on the study. The families represented contained 227 adults and 121 children, or 348 individuals. The majority were farmers and although they produced grains of different types, there was little relationship between these and the cereals used. Many more had corn ground for family consumption than had wheat or sorghum grains.

Twenty-four of the 100 families used whole wheat flour. Based on the quantities used monthly, the ratio of white to whole wheat flour was 17 to one. Actual dislikes was the reason given by 34 families for failure to use whole wheat flour.

Breads listed as frequently used were in the order given:

Cornbread -----	91
Biscuits -----	87
Bread, enriched flour -----	58
Muffins -----	41

Breads listed by a large number of families as never used were:

Whole wheat rolls-----	82
Whole wheat biscuits-----	77
Whole wheat muffins-----	66
Whole wheat bread-----	56

Listed as frequently used were:

Cookies -----	44
Cakes -----	39
Pastry -----	35

While 76 homemakers indicated the use of white cornmeal, only 12 indicated the use of yellow. Included in the study was an analysis of the use of various breads and flour mixtures with reference to the three meals. The following data show this distribution as indicated by the 100 homemakers:

	<i>Breakfast</i>	<i>Noon meal</i>	<i>Evening Meal</i>
Toast	36	1	3
Griddle cakes	1	0	0
Waffles	1	0	0
Biscuits	71	29	25
Bread	6	32	29
Cornbread	0	84	70
Rice	3	9	4
Cookies	0	48	38
Cake	0	45	26
Pastry	0	17	14
Rolls	10	9	7

The breakfast cereals most frequently used were as follows:

Oatmeal -----	49
Cornflakes -----	47
Branflakes -----	34
All-bran -----	24
Raisin bran -----	19
Grapenuts -----	17
Shredded wheat -----	16
White rice -----	12
Cream of wheat -----	11
Corn meal mush -----	11

The six cereals listed as never served by the largest number of homemakers were dark farina, light farina, wild rice, cracked wheat, brown rice and Ralstons, several of which are whole grain or nearly whole grain. Each was listed as never used by more than 80 percent of the homemakers.

Of the 348 individuals represented in the homemakers' reports, 16 refused all cereals and 146 accepted all. In proportion to the number of products listed from each grain, more individuals liked those from oats and fewer liked those from rice.

Studies of the food habits of school children were made in three Texas communities; 50 from Denton, 74 from Huntsville and approxi-

mately 40 from Childress. In the Denton and Huntsville studies records of the food consumption were kept for periods of five days for each student. The types of foods observed may be considered indicative of the foods used by the families.

On the 250 records secured in the Denton study, a considerable stability was observed in milk consumption. If a child drank three-fourths quart or more on one day he would likely drink a comparable amount on other days, or if he drank no milk on one day he seldom drank more than the minimum amount on other days. In the Huntsville study, no significant difference was noted between the amounts of milk used by rural and by urban girls.

In both studies there was a conspicuous deficiency in the use of green and yellow vegetables. Not one of the 74 Huntsville girls included this group of foods to the recommended extent. Most girls, however, consumed tomatoes and citrus fruits in sufficient amounts.

Of the 250 Denton records, 92.4 percent included no whole grain cereals, 68.8 percent no legumes or cheese, 34 percent no eggs, 13.2 percent no milk, 10 percent no fruit, 3.6 percent no meat and 1.6 percent no vegetables. Twenty varieties of vegetables and 14 varieties of fruits were listed. These together with the frequency with which they were listed are given below:

VEGETABLES

	No. of Days Recorded	Percent of Total
I. potatoes	135	54.0
Tomatoes	83	33.2
Cabbage	71	28.4
Lettuce	60	24.0
Green peas	39	15.6
Carrots	33	13.2
Green beans	32	12.8
Spinach	23	9.2
Corn	21	8.4
Onions	10	4.0
Hominy	9	3.6
Greens	8	3.2
Sweet potatoes	6	2.4
Beets	5	2.0
Radishes	2	0.8
Celery	2	0.8
Squash	1	0.4
Cauliflower	1	0.4
Green peppers	1	0.4
Asparagus	1	0.4

FRUITS

	No. of Days Recorded	Percent of Total
Apples	97	38.8
Oranges	80	32.0
Bananas	67	26.8
Grapefruit	38	15.2
Dried apricots	17	6.8
Dried prunes	17	6.8
Canned pineapple	16	6.4
Dried peaches	10	4.0
Strawberries	7	2.8
Canned pears	7	2.8
Canned peaches	7	2.8
Lemons	3	1.2
Canned berries	3	1.2
Dried apples	1	0.4

The meats included in the 250 records are also recorded below:

Meat	No. of days Recorded	Percent of Total
Pork	114	44
Beef	83	33
Sandwich meat	38	15
Sausage	25	10
Fish	11	4
Chicken	10	4
Hamburger	10	4
Liver	2	1

The number of servings of meats, fruits and vegetables which appeared on the daily records was studied and summarized as follows:

Percent of Records Showing a Specified Number of Servings of Meats, Fruits and Vegetables

No. of Servings	0	1	2	3
	Percent	Percent	Percent	Percent
Vegetables	1.6	22.0	33.2	43.2
Fruit	10.4	43.2	34.0	12.4
Meats	3.6	35.2	45.2	12.8

The study carried out at Childress, Texas, in 1942, was planned for the purpose of determining some of the factors which influenced the acceptance of foods included in the noon lunch for 38 children over a period of one month. Since the lunch was based on surplus foods, it included a very limited variety of foods. The results are summarized in the accompanying table. Acceptances of the entire serving were highest for breads, cocoa, blackeyed peas, grapefruit juice, carrot strips and apple sauce, in the order given. Refusals of the entire serving were highest for turnip greens, canned tomatoes, prunes and apple sauce, as listed.

TABLE I
DISTRIBUTION OF ACCEPTANCES OF CERTAIN
FOODS INCLUDED IN SCHOOL LUNCHES OF
38 CHILDREN IN CHILDRESS, TEXAS

Food	No. of Times Served	No. of Obs.	Accepted Entire Serving	Accepted Part of Serving	Refused Entire Serving
			%	%	%
Irish potatoes	8	255	77.2	14.5	8.2
Sweet potatoes	2	71	74.6	14.0	11.2
Brown beans	9	277	73.4	19.1	6.4
Blackeyed peas	3	104	82.6	12.3	4.8
Turnip greens	3	108	58.3	21.3	20.3
Cooked mixed foods	3	106	71.8	15.0	13.2
Canned tomatoes	4	117	71.8	8.5	19.6
Carrot strips	5	157	82.1	7.6	9.5
Salads	8	260	77.3	10.3	12.3
Apple sauce	3	98	80.6	5.1	14.2
Prunes	4	162	79.6	5.5	14.8
Breads	10	331	85.8	12.6	1.5
Cocoa	3	91	84.6	10.0	4.5
Grapefruit juice	15	472	82.2	7.4	10.3

During the period, potatoes were presented with four different methods of preparation. The popularity of these methods is indicated by the percentages of complete acceptances:

Percent	
Potato salad	82.8
Mashed potatoes	81.9
Scalloped potatoes	77.2
Baked potatoes	73.2

Complete acceptances of Irish potatoes exceeded those of sweet, and the percentage of entire refusals was smaller for the former than the latter. The method of preparation apparently influenced the acceptability of sweet potatoes more than Irish. Candied sweet potatoes were accepted much better than baked. With the former there were 83.3 percent acceptances and with the latter only 60.0 percent. The complete refusals for candied were only 2.7 percent but for the baked 20.0 percent.

In general the mixed cooked foods which included macaroni and tomatoes and cabbage and carrots, were not highly acceptable. Tomatoes were made more acceptable by heating. Carrots were accepted better when served alone than when served in a mixture, either raw or cooked. Carrot strips were the most popular method of serving.

	No. of Observations	Complete Acceptances Percent	Complete Refusals Percent
Carrot strips	157	82.1	9.5
Carrot and Cabbage Cooked	32	46.8	15.6
Carrot and Cabbage Salad	27	74.0	11.1

Cabbage slaw was the least popular of all salads. It was made more acceptable by the addition of other substances, notably apples. Raw cabbage was more acceptable than cooked cabbage.

	No. of Observations	Complete Acceptance Percent	Complete Refusals Percent
Cabbage Slaw	69	67.9	20.3
Cabbage and Carrot	27	74.0	11.1
Cabbage and Apples	93	84.9	2.7
Combination	71	77.4	18.2

No relationship was observed between age and acceptances or refusals of food. Children receiving the lunch free had a better appetite than those who had the money to pay for their lunches. Girls had fewer complete acceptances of food than the boys, and emphasis should be given to efforts to increase the acceptance of the green and yellow vegetables.

A possible relationship was observed between the temperature and the refusals of food. A record of the temperature at the noon hour was

recorded daily. All observations were made in February during which time the temperature varied from 32° to 82°F. The coefficient of correlation between the temperature and refusals was 0.68. As the temperature increased there was a tendency for the percentage of refusals to decrease. On the five days with the smallest percentage of refusals the average temperature was 67°F. On the days with the largest percentage of refusals the average temperature was 47°F.

A further effort was made to study some of the conditions which influence acceptance and rejection of foods in two large dormitory dining halls used by the students of Texas State College for Women at Denton. Each serves approximately 900 students. From March 12, to May 7, 1945, all of the food returned on the plate was weighed and observed. The average waste for each student was calculated both on the meal and the daily basis. Both groups were served the same menu and according to the same system, standardized recipes were used, but the food was prepared in two separate kitchens both of which were under the supervision of a trained dietitian.

The most constant observation was that the waste was consistently higher in the dining room in which the two upper classes were served than with the lower classes. Fluctuations were also much greater. These fluctuations seemed to take place at certain periods rather than continuously through the study. It may be of interest to note that the periods of greatest differences between the refusals of the older and the younger girls seemed to coincide somewhat with the trend of national events. The greatest deviations between the two groups took place between March 23 and April 8. War news at this time referred largely to Patton's spearhead into Germany. It seems possible that the older girls reacted to this situation with a greater degree of tenseness than the younger. That fluctuations in appetite of the older girls may have been particularly susceptible to world news is suggested again by the food waste at the time of President Roosevelt's death.

WASTE PER STUDENT PER DAY

	Breckenridge Ounce	Lowry Ounce	
April 9	8.75	8.77	
April 10	10.38	8.75	
April 11	10.21	9.22	
April 12	8.22	9.98	News of President Roosevelt's death late in the afternoon.
April 13	12.83	9.94	Memorial programs
April 14	12.15	10.20	Funeral services Sun-
April 15	7.41	6.62	day
April 16	9.45	9.45	

No relationship was observed to exist between the waste and campus events, social or otherwise. The announcement of failing goods on March 30 produced no obvious change.

Food refusals were least at breakfast, next at luncheon and greatest at dinner. No particular rhythm was noted with the days of the week. During this period numerous devices were used to stimulate the girls to more complete acceptance of their food such as pamphlets, talks in the dormitories, competition between the two dormitories, personal conferences and campus newspaper articles. Not any one of these measures was accompanied by a noticeable change in acceptance of the food.

As in the preceding study, there was a tendency for the waste to be slightly higher on cool than on warm days.

	Breckenridge Ounce	Lowry Ounce
Warm days	9.23	8.19
Cool days	9.94	8.49

The unpopularity of foods was judged by their frequent appearance in the waste and the amounts returned. Vegetables were frequently listed; fruits much less frequently. The vegetables which were reported as being refused frequently and in large amounts were rutabagas, cauliflower, squash, beets, cabbage, asparagus, eggplant, turnip greens, mustard greens. Certain vegetables were reported as especially unpopular when creamed such as creamed onions, creamed celery, and creamed fresh asparagus. French fried onions were popular.

Canned figs and stewed prunes were reported as wasted in large amounts. Some waste was

reported for grapefruit and oranges served in the shell and baked apples because of difficulty in eating. Waste of lettuce salad was also reported for this reason.

The most unpopular protein dishes were haddock, mackerel, highly seasoned *sau sage*, creamed ham and eggs in almost any manner of preparation.

Unpopular desserts were bread pudding, rice pudding and boiled custard.

Reasons for food refusals included eating too much of better-liked foods, difficulty of eating, food too cold, food too highly seasoned. In this, as in other studies, reasons for dislike of food are vague. Frequently the reasons given are disliked taste, makes ill, don't know, habit.

Since many of the girls who eat in the dormitory dining halls come from homes similar to those included in the dietary studies, it is prob-

able that they are served in the college a much more varied diet than that to which they are accustomed. Their unfavorable response to this diet indicates perhaps the important influence which previous food habits have on the acceptance of food. This is apparently a much stronger force than that provided by the educational measures used during the period of the study and all the efforts made to serve food in an attractive and interesting manner.

Using a check list of approximately 175 foods, a study was made of the attitude of 250 individuals of five age groups with 25 males and 25 females in each group. The foods were checked as to whether or not they were liked, disliked, accepted, unfamiliar. The list follows and the percentages of likes in each group are shown on the scale. In the tables may be observed the distribution of likes, dislikes, and acceptances with respect to the different groups and the extent of lack of familiarity.

STUDY OF FOOD LIKES AND DISLIKES

The following list of approximately 175 foods was checked as liked, disliked, accepted or as unfamiliar by 250 persons in North Texas. The group was distributed as follows

Fifth grade girls	25
" " boys	25
Eighth grade girls	25
" " boys	25
High school girls	25
" " boys	25
College girls	25
" boys	25
Women	25
Men	25

The replies with reference to likes are shown on the accompanying food likes scale and further analysis of the data is included in the tables attached.

CHECK LIST OF FOODS

Milk Products	Meat, Poultry, Fish, or Cheese
1. Buttermilk	5. Corn syrup
2. Clabber	6. Honey
3. Condensed-sweetened	7. Ice cream
4. Cream	8. Jam
5. Dried skim milk	9. Jelly
6. Dried whole milk	10. Pie
7. Evaporated-unsweetened	11. Preserves
8. Skimmed sweet milk	12. Pudding
9. Whole raw sweet milk	13. Sorghum molasses
10. Whole pasteurized milk	
Eggs	
Potatoes	
1. Irish	1. Bacon
2. Sweet	2. Beef-corned
Sweets	3. Beef-dried
1. Cake	4. Beef roast
2. Candy	5. Beef steak
3. Cane syrup	6. Beef stew
4. Cookies	7. Brains
	8. Catfish
	9. Cheese-American
	10. Cheese-cottage
	11. Cheese-others
	12. Chicken
	13. Crabs

CHECK LIST OF FOODS (Continued)

14. Duck	2. Asparagus	9. Onions	Whole Grain Products, Other Cereals, and Bread
15. Flounder	3. Beet tops	10. Radishes	
16. Guinea	4. Broccoli	11. Turnips	
17. Ham-cured	5. Brussels sprouts	Citrus, Tomatoes, Raw	Prepared breakfast
18. Kidney	6. Cabbage	Cabbage, Strawberries	cereals
19. Liver	7. Carrots	or Melons	
20. Oysters	8. Chard	1. Cabbage, raw	1. Bran
21. Pork chops	9. Collards	2. Cantaloupe	2. Corn flakes
22. Pork roast	10. Endive	3. Grapefruit	3. Grapenuts
23. Pork sausage	11. Kale	4. Grapefruit juice	4. Kix
24. Salmon	12. Lettuce-head	5. Lemons	5. Pep
25. Sardines	13. Lettuce-leaf	6. Limes	6. Post Toasties
26. Shrimp	14. Lettuce-Romaine	7. Muskmelons	7. Puffed cereals
27. Squab	15. Mustard greens	8. Oranges	8. Rice Krispies
28. Sweetbreads	16. Okra	9. Orange juice	9. Shredded Ralston's
29. Tongue	17. Peas, English	10. Strawberries-fresh	10. Shredded Wheat
30. Trout	18. Peas, fresh	11. Tomatoes-canned	11. Wheatus
31. Tuna	blackeyed	12. Tomatoes-fresh	
32. Turkey	19. Peppers, green	13. Tomato juice	Unprepared breakfast
33. Veal cutlets	20. Pumpkin	14. Watermelon	cereals
34. Veal roast	21. Rhubarb		
	22. Rutabaga		12. Cream of Wheat
	23. Spinach		13. Oatmeal
	24. Squash		14. Ralston's
	25. String beans		15. Rice, brown
	26. Turnip greens		16. Rice, white
	27. Watercress		

Butter or margarine

1. Butter
2. Margarine
3. Margarine with vitamins added

Beverages

1. Cocoa or chocolate
2. Coffee
3. Tea

Other Vegetables

1. Beans, Lima
2. Beans, navy
3. Beans, pinto
4. Cauliflower
5. Celery
6. Corn
7. Eggplant
8. Leeks

Other Fruits

1. Apples
2. Apricots
3. Avocado
4. Bananas
5. Blackberries
6. Cherries
7. Cranberries
8. Dates
9. Figs
10. Grapes
11. Grape juice
12. Olives
13. Peaches
14. Pears
15. Persimmons
16. Pineapple
17. Plums
18. Pomegranates
19. Prunes
20. Raisins
21. Raspberries

Breads

17. Biscuits
18. Bread-white
19. Bread-whole wheat
20. Cornbread
21. Corn pone
22. Crackers, graham
23. Crackers, soda
24. Muffin-bran
25. Muffin-white
26. Muffin-whole wheat
27. Pancakes
29. Rolls-cinnamon
30. Rolls-plain
31. Rolls-whole wheat
32. Waffles

Other cereal foods

33. Hominy
34. Macaroni
35. Spaghetti
36. Tapioca
37. Vermicilli

Green or Yellow Vegetables

1. Artichoke

TABLE II
Percentages of Foods Listed Checked as Unfamiliar

FOOD GROUP	FIFTH GRADE		EIGHTH GRADE		HIGH SCHOOL		COLLEGE		ADULT	
	G	B	G	B	G	B	G	B	G	B
Milk Products	33.2	33.2	22.4	19.6	14.7	14.0	16.4	20.4	21.6	24.8
Eggs	—	—	—	—	—	—	—	—	—	—
Meats, etc.	42.0	33.7	20.0	24.6	19.8	9.5	7.5	11.3	7.3	8.1
Potatoes	6.0	12.0	2.0	—	—	—	—	—	—	—
Green & Yellow Vegetables	47.4	46.3	38.2	41.2	28.5	29.8	23.1	28.2	17.3	21.0
Other vegetables	32.8	32.9	22.9	12.0	16.7	12.0	9.1	10.2	10.2	10.5
Citrus, tomatoes, etc.	17.7	12.0	6.0	7.4	3.1	1.7	3.7	2.0	0.6	0.0
Other fruits	28.6	21.7	7.8	12.9	7.8	6.5	2.4	5.1	2.4	4.4
Cereals, Breads	35.2	28.1	17.6	23.6	7.4	8.0	4.7	9.8	7.7	10.4
Sweets	17.5	14.5	7.3	5.5	1.8	0.3	0.3	1.2	0.3	0.0

TABLE III
Percentages of Familiar Foods Checked as Liked

FOOD GROUP	FIFTH GRADE		EIGHTH GRADE		HIGH SCHOOL		COLLEGE		ADULT	
	G	B	G	B	G	B	G	B	G	B
Milk Products	75.0	78.6	48.6	49.5	61.3	55.5	64.3	67.8	74.7	73.4
Eggs	92.0	95.9	87.0	100.0	91.6	91.6	88.0	100.0	100.0	95.8
Meats, etc.	83.6	90.6	68.8	77.7	78.7	76.6	80.0	85.5	85.4	85.8
Potatoes	91.4	95.6	93.9	92.0	94.0	90.0	92.0	89.4	90.0	94.0
Green & Yellow Vegetables	73.5	82.7	55.0	61.7	67.9	62.4	70.7	67.6	84.0	75.5
Other vegetables	79.5	88.2	66.0	71.6	71.0	78.2	70.4	71.8	91.4	82.0
Citrus, tomatoes, etc.	92.9	88.7	81.6	87.6	89.2	94.1	90.0	90.4	96.0	88.8
Other fruits	86.0	94.0	78.0	84.3	94.3	90.2	88.0	89.6	90.0	86.5
Cereals & Breads	81.0	89.5	64.1	80.5	74.3	88.0	77.2	85.5	84.1	82.8
Sweets	89.0	94.3	80.7	87.5	78.0	91.0	85.5	90.5	89.5	92.6

TABLE IV
Percentages of Familiar Foods Checked as Disliked

FOOD GROUP	FIFTH GRADE		EIGHTH GRADE		HIGH SCHOOL		COLLEGE		ADULT	
	G	B	G	B	G	B	G	B	G	B
Milk Products	18.6	20.3	33.0	43.9	27.5	30.6	26.2	20.0	22.7	13.7
Eggs	4.0	4.1	4.3	0.0	4.2	8.4	0.0	0.0	0.0	0.0
Meats, etc.	10.2	7.7	19.5	16.6	15.6	17.5	12.0	7.2	9.9	7.9
Potatoes	6.5	2.2	2.0	6.0	6.0	4.0	4.0	0.0	4.0	4.0
Green & Yellow Vegetables	15.3	12.2	30.0	33.5	28.4	24.3	19.5	19.9	5.7	14.9
Other vegetables	11.5	8.4	19.6	24.1	21.3	14.5	16.8	9.8	5.3	11.5
Citrus, tomatoes, etc.	2.5	5.9	10.7	12.0	6.8	4.4	3.4	1.6	2.8	6.3
Other fruits	4.4	4.8	13.6	14.6	9.6	4.7	6.1	4.7	4.7	9.7
Cereals & Breads	10.7	7.2	13.0	16.9	15.6	7.9	10.1	3.7	8.6	6.7
Sweets	7.0	3.2	10.3	9.8	10.3	3.1	6.5	1.9	4.0	2.2

TABLE V
Percentages of Familiar Foods Checked as Accepted

FOOD GROUP	FIFTH GRADE		EIGHTH GRADE		HIGH SCHOOL		COLLEGE		ADULT	
	G	B	G	B	G	B	G	B	G	B
Milk Products	6.4	1.2	18.5	6.6	11.2	13.9	9.5	12.2	2.6	12.9
Eggs	4.0	0.0	8.7	0.0	4.2	0.0	12.0	0.0	0.0	4.2
Meats, etc.	6.2	1.7	11.7	5.7	5.7	5.9	8.0	7.3	4.7	6.3
Potatoes	2.1	2.2	4.1	2.0	0.0	6.0	4.0	10.6	4.6	2.0
Green & Yellow Vegetables	11.2	5.1	14.7	4.6	3.7	13.3	9.8	12.5	10.3	9.6
Other vegetables	9.0	3.4	14.4	4.3	7.7	.73	12.8	18.1	3.3	6.5
Citrus, tomatoes, etc.	4.6	5.4	7.7	0.4	4.0	1.5	6.6	8.0	1.2	4.9
Other fruits	9.6	1.7	8.4	1.1	6.1	5.1	5.9	5.7	5.3	3.8
Cereals & Breads	8.3	3.3	22.8	2.6	10.1	4.1	12.7	10.8	7.3	9.5
Sweets	4.0	2.5	9.0	2.6	11.7	5.9	8.0	7.6	6.5	5.2

TABLE VI

Scale of Food Likes

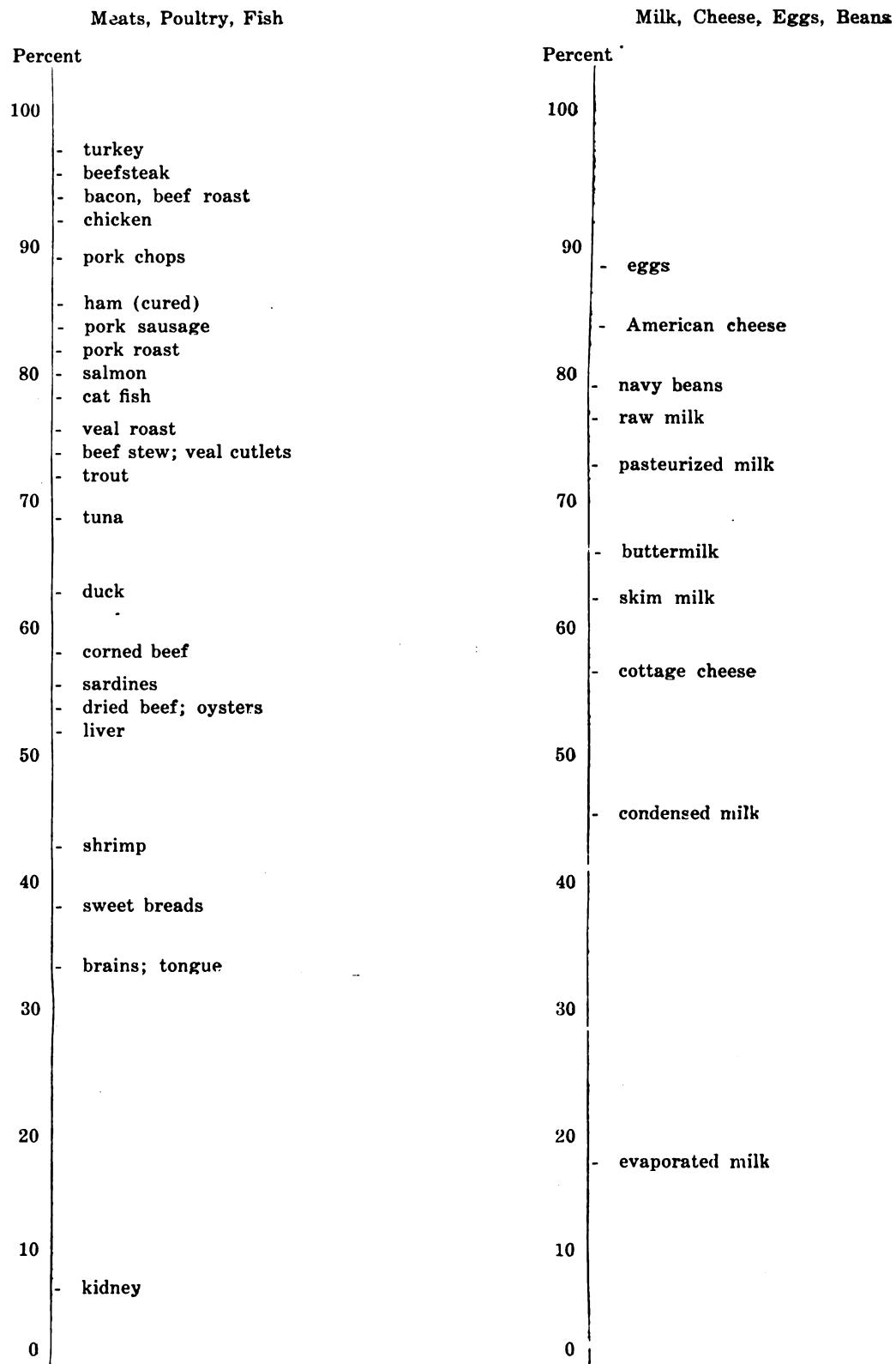


TABLE VII

Scale of Food Likes

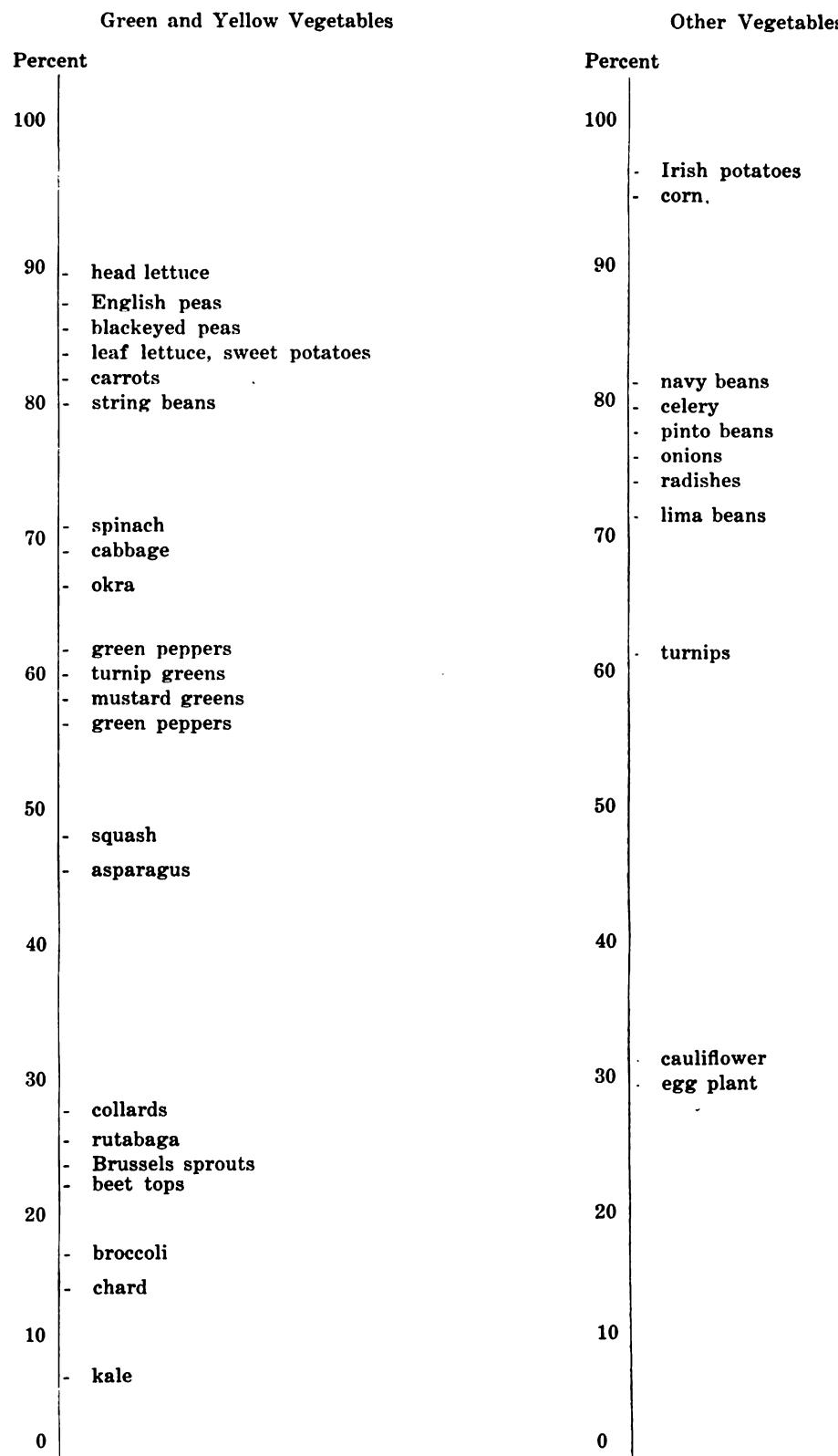


TABLE VIII
Scale of Food Likes

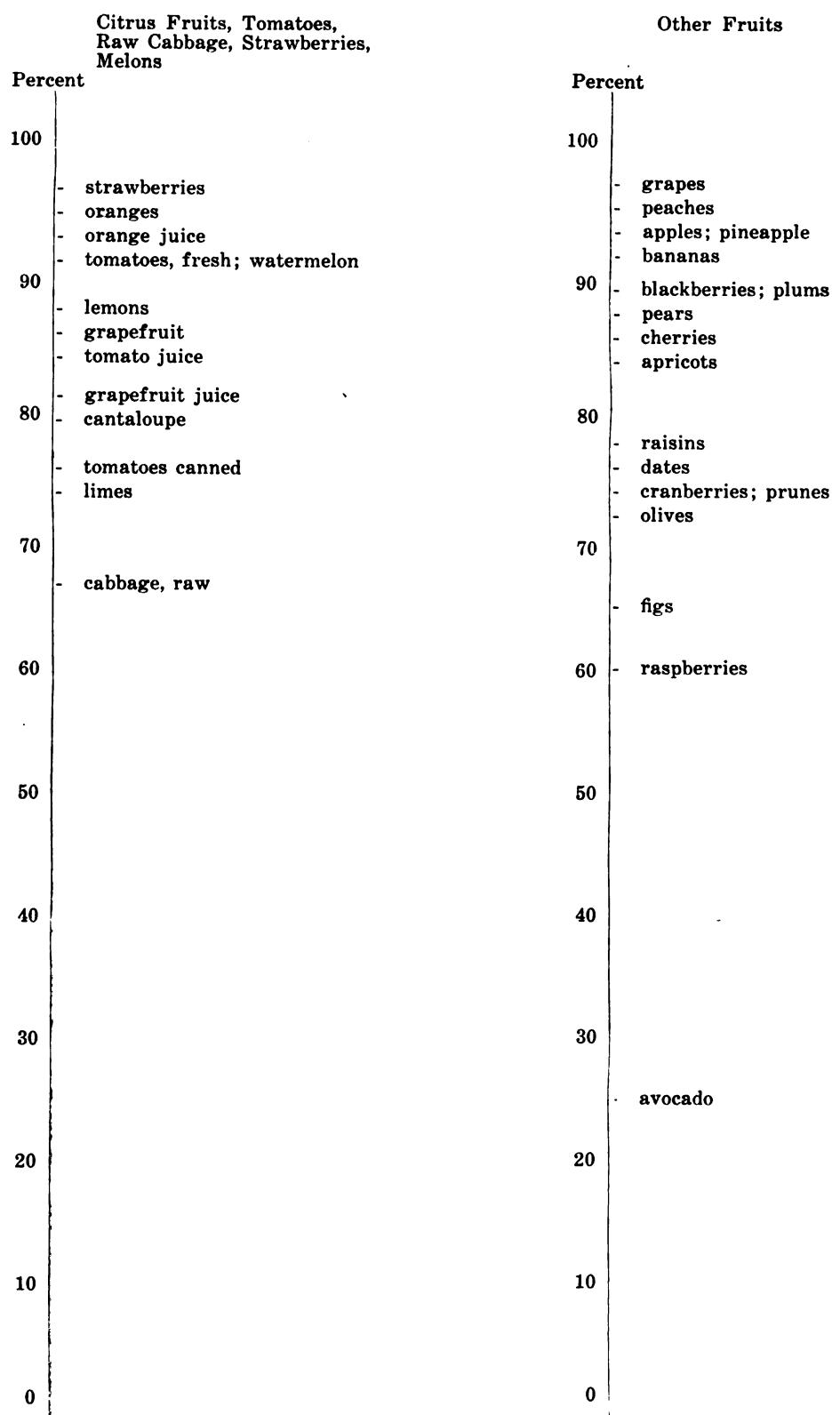


TABLE IX
Scale of Food Likes

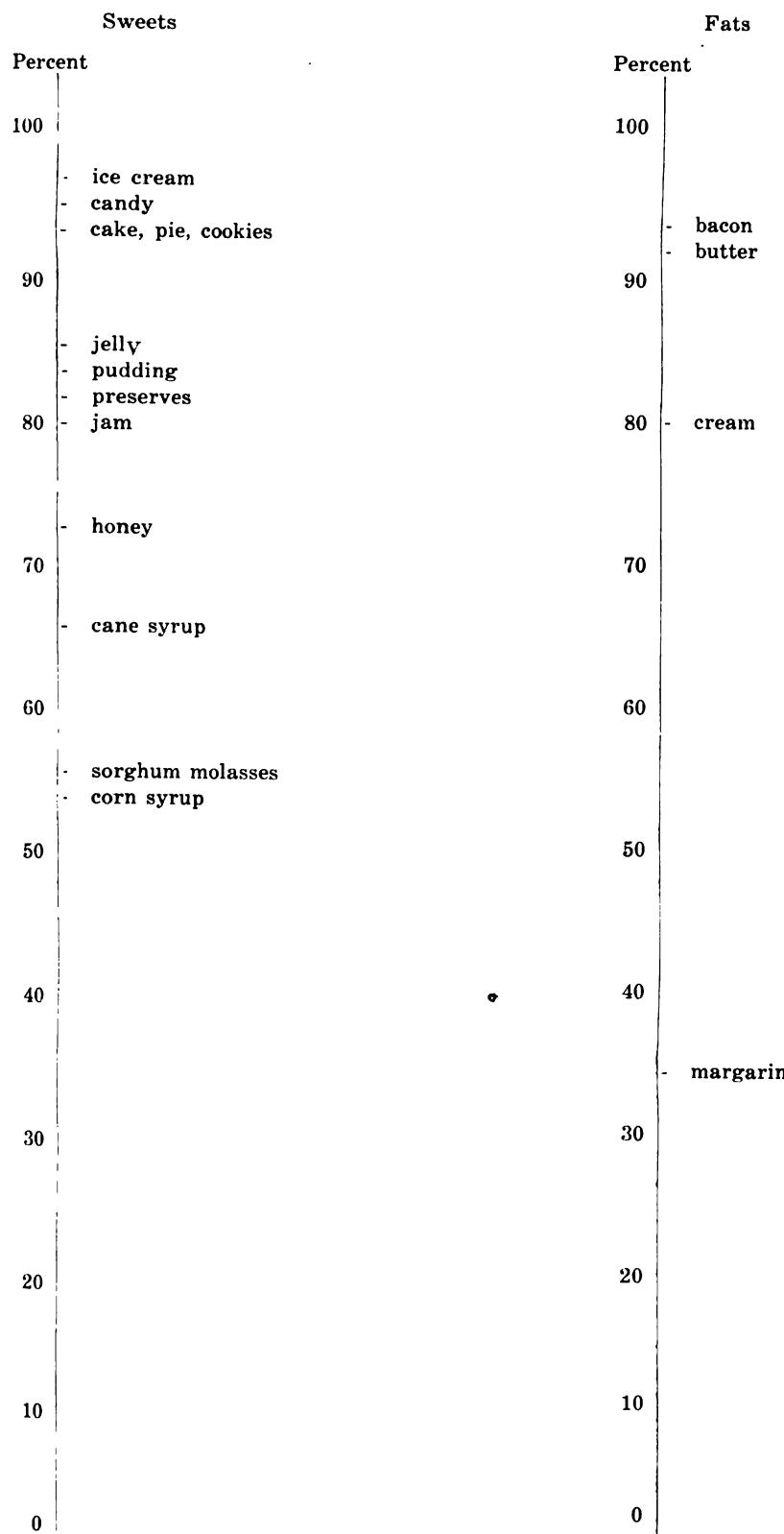
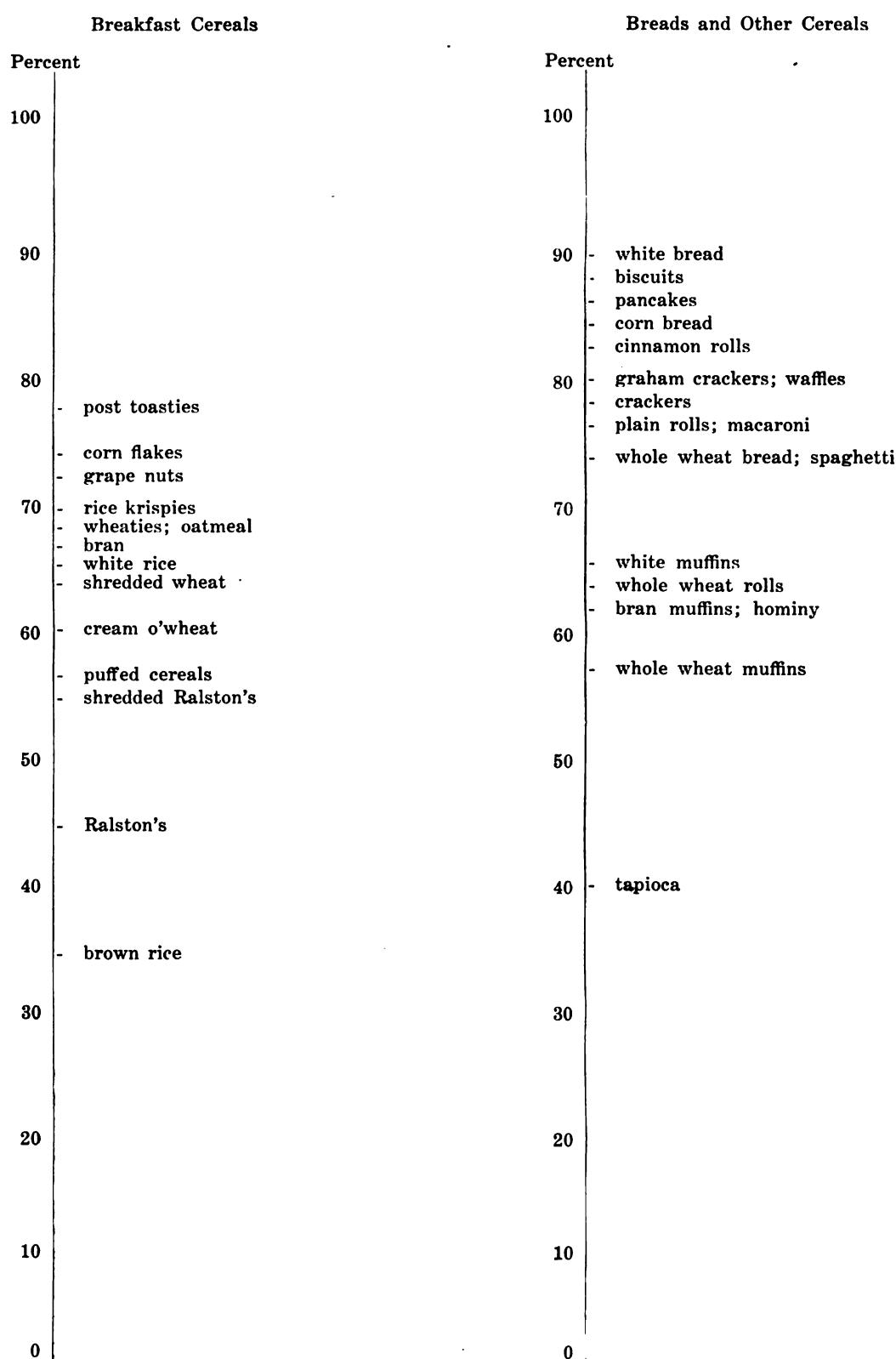


TABLE X
Scale of Food Likes



It will be observed that percentage of foods liked in almost every group of foods was much lower for eighth grade boys and girls than either of the other groups. The main exceptions were eggs and potatoes. Usually the percentages of familiar foods liked were higher for the male than the female members of the group. The most unpopular groups were green and yellow vegetables and the dairy products. Unfamiliar foods in the milk product group included dried whole milk, dried skim milk, evaporated milk, condensed milk and skim milk. In the meat group the foods with which there was the greatest unfamiliarity were kidney, flounder, guinea, sweet breads, crabs, squab, shrimp, tongue, dried beef, corned beef, duck, trout and brains. Green and yellow vegetables which ranked highest in unfamiliarity were endive, kale, artichoke, watercress, chard, broccoli, Romaine lettuce, Brussel's sprouts and rutabagas. Other

vegetables which were frequently unfamiliar were leeks, eggplant, cauliflower, lima beans, pinto beans. The most frequently unfamiliar fruits listed were pomegranates, avocado, raspberries and persimmons.

Based on the familiar foods, the foods listed most frequently as disliked were clabber, buttermilk, cottage cheese and skim milk in the dairy products group; brains, tongue, kidney, sardines, liver, oysters; and dried beef in the meat group; beet tops, mustard greens, squash, asparagus, okra, pumpkin, cabbage, peppers and turnip greens among the green and yellow vegetables; cauliflower and eggplant among the other vegetables; persimmons, figs, olives, avocado, dates in the fruits, all notably of the non-acid type; and honey was ranked first in the dislikes among the sweets.

FOOD HABITS IN CALIFORNIA.

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Relatively few studies have been made of the different kinds of foods eaten by people living in California and practically none have attempted to relate diet to nutritional status.

California has a rather wide range of food tastes probably due to two factors. One is the large number, about 200, of food crops grown in this state, and the other is the presence of racial groups, such as Mexican, Chinese, and Armenian, which have an influence on home food habits as well as on foods served in restaurants.

DIETARY STUDIES

The United States Bureau of Labor Statistics in 1934-1936⁽¹⁾ recorded the quantities of food purchased by 350 to 500 families in each of the following cities: San Diego, Sacramento, Los Angeles, Seattle and San Francisco-Oakland. It was noted that citrus fruits held a place of relatively high importance in the diet of families in these Pacific Coast cities.

Steibling and Phipard of the Bureau of Home Economics⁽²⁾ made dietary records at different seasons of the year and in different regions of the country on about one fourth the families selected from among those cooperating in the study of income and disbursements made by the United States Bureau of Labor Statistics. In Pacific Coast cities, families represented a higher economic level than those cooperating in the general study. Among white families, those in Pacific cities consumed the largest quantity of leafy, green and yellow vegetables, important foods as a group because of their mineral and vitamin content. These families also consumed more citrus fruit than other groups studied at every level of food expenditure. It was noted that the high consumption of carrots and lettuce by Pacific Coast families was outstanding. Pacific Coast families were found to have consumed more eggs, more cream and ice cream, more lamb and mutton and less pork than other regions.

Butter was used most freely in the Pacific and North Atlantic cities and least in the South. About a fifth of the total bread purchased was dark, rye or whole wheat, compared with a tenth in East-North-Central cities. Whole wheat bread was most popular in Pacific Coast cities.

In 1942 Wiehl⁽³⁾ made a dietary study of about a thousand young men employed as aircraft workers in Southern California. Nearly one third had lived in California less than one year, while 30 percent had lived there 10 years or more. Diets were classed as satisfactory, marginal and unsatisfactory. Little difference was found in the diets of men recently arrived in California and those who had lived there five years or longer. Dietary differences by age group were greater than according to time of residence in California. As age increased, there was an increase in the number of types of food used in insufficient amounts, particularly milk and citrus fruit or tomatoes. Wiehl noted that the high percentage of men with so low an intake of Vitamin C in a citrus-growing region where citrus fruit and leafy vegetables are cheaper throughout the year than in most parts of the country was probably due to the scanty breakfast of many of these men.

SUMMARY

Except for the diet surveys of the United States Bureaus of Labor Statistics and Home Economics, food habit studies in California appear to have been made only with specialized groups.

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HISTORICAL INFLUENCE AND REGIONAL DIFFERENCES IN UNITED STATES FOOD HABITS

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There is considerable evidence that food habits differ in point of place. The existence of patterns has been mentioned by preceding speakers. There are scattering statements as to food habits in early records. Surveys or samplings of food habits on a large scale have become more common during the past half century. Surveys in both format and results illustrate, from the historical standpoint, growth in knowledge and expansion of the economy. Examples of early accounts and surveys have been remarked here with a view of indicating the extent of influences bearing on modifications of food habits in various regions.

In 1623, after anxious waiting, good weather appeared, and the Pilgrims of Plymouth rejoiced that their maize was saved. Governor Bradford adds: "For which mercie, in time conveniente, they also sett aparte a day of thanksgiving." This was the Pilgrims' third crop. They had brought certain provisions and familiar seeds on the ship from England but there was no opportunity to plant in 1620. During the following winter half the company died, "being infected with the scurvie and other diseases, which this long voyage and their inacomodate condition had brought upon them."

In the spring of 1621 the Indian, Squanto, taught the survivors to plant seeds with fish as fertilizer. "Some English seed they sew, as wheat and pease, but it came not to good, eather by the badness of the seed, or lateness of the season, or both, or some other defecte". That summer they fished and enjoyed wild water fowl, wild turkeys and venision. "Besides they had aboute a peck a meale a weake to a person, or now since harvest, Indian corne to that proportion, which made many afterwards write so

largely of their plenty to their friends in England". But the reports were premature. The harvest of 1622 was small, "partly by reason they were not yet well acquainted with the manner of Indian corne, (and they had no other) allso their many other imployments, but cheefley their weaknes for want of food, to tend it as they should have done". Then in 1623, after a long drouth, came the rain, "with such sweete and gentle showers, as gave them cause of rejoicing and blessing God".⁽¹⁾

The Pilgrims were not unfamiliar with alternating periods of want and plenty. In the Seventeenth Century these existed in rural England. Plenty at harvest and scarcity in spring were apt to occur before transportation systems and markets were well developed. The Seventeenth Century lay in the age of Western World famines. Students of food acceptance in that period find use made of the bark of trees and many kinds of flesh.⁽²⁾ Even in normal times, food in English farming areas was plain and heavy. Burton, writing in 1621, states, "Husbandmen and such as labor, can eat fat bacon, salt gross meat, hard cheese &c. (*O dura messorum ilia!*), coarse bread at all times, go to bed and labour upon a full stomach, which to some idle persons would be present death".⁽³⁾

"Coarse bread" was made from corn. Corn, as Professor Ashley points out, was a generic term applicable to wheat or rye.⁽⁴⁾ It was to be expected that it would be attached to maize with the prefix, "Indian". In England wheat and rye were sometimes sown together. The crop when ground gave a dark flour for making maslin bread. In New England areas where wheat did not grow well, maize and rye were sometimes used in equal proportions for brown bread.

With the growth of commerce and improved transportation, wheat flour became a common breadstuff. Brown bread, still made with maize and rye flour, became an occasional food.

Racial dishes were identified with various colonies; the cruller among the Dutch of New York; sauerkraut among the Germans. The Scotch-Irish "ate potatoes and the English did not; the Irish put barley into their potliquor and made barley-broth, the English put in beans and had bean porridge".(5) In the pioneer's cart in both North and South went maize seed and alongside stumped the pig. "Give me the children," says Cooper's frontier housewife, "that's raised on good sound pork afore all the game in the country. Game's good as a relish and so's bread; but pork is the staff of life".(6)

In the cities and in the mansions of the South, luxuries were enjoyed. But among single cropers food was monotonous. Jefferson in a frequently-quoted passage comments on the "illy fed" men and animals of the tobacco region.(7) In the Cotton Kingdom food habits were notoriously poor. Frederic Law Olmsted, in the 1850's, reports planters' food as bacon, sometimes cooked with turnip greens, cornpone and coffee sweetened with molasses instead of sugar. On leaving Kentucky for Texas he "innocently" ate salt pork and cornbread, not realizing that for the next half year he would see nothing else.(8)

Little attention was given to gardening by many farmers in both South and North. Refrigeration was difficult in the former section and dairying was frequently neglected. Bad teeth and skin ailments were not uncommon. Spruce beer, made by brewing the tips of young spruce, was used as an anti-scorbutic. Here was an excuse for chewing gum. A newspaper advertisement of 1850 reads, "A superior preparation of Spruce Chewing Gum for cleansing and preserving the Teeth, a most admirable article for sweetening the breath, imparting a delicious fragrance to it, and leaving the Teeth and Guns in a healthy condition."(9)

The accounts of pioneers are rich in food acceptances. The frontier line had crossed the Mississippi and reached western Missouri by

1830. Beyond the plains the Northwest beckoned. Oregon, little visited by Americans, caught the imagination of Nathaniel Wyeth, descendant of one of the first families of Cambridge, Massachusetts. Wyeth's party, leaving St. Louis in May, 1832, drove its own cattle, exhausting supplies in the buffalo country along the Platte River. They subsisted on buffalo meat until after reaching the area beyond the continental divide where there were no buffalo and beaver were not plentiful. Horses and dogs, traded from the Indians, were sometimes used as food. In the autumn Wyeth reached Fort Walla Walla where cattle and hens kept by the staff of the Hudson Bay Company were a welcome sight.(10) He returned to Massachusetts, and apparently none the worse, set out on a second expedition, taking along Thomas Nuttall, "first scientist of Harvard's Augustan Age" and the ornithologist, John Townsend. Townsend returned to camp one day to find Nuttall had cooked and eaten a specimen owl. A rascally helper drank alcohol in which lizards and snakes were preserved.

Wyeth's party had many opportunities to observe customs among Indian tribes along their route. One evening they sat down to a stew containing game, fish and the remains of a colt. A chief of the Snake Indians entered the camp and was invited to join them. He ate with gusto. Suddenly his face changed. He ejected a large mouthful and stalked out of the tent saying, *Shekem*, Indian dialect for horse. Townsend was amazed that this Indian, whose tribe apparently respected horses, was able to detect the taste in the composite dish.(11) With regard to horses, Wyeth's horses on the first expedition had mysteriously sickened near a tributary of the Green River in present-day southern Wyoming. The same phenomenon occurred on the second expedition. In an article in a recent number of *Agricultural History* the existence of selenium deposits from South Dakota to Mexico is noted, and it is suggested that selenium poisoning may have been a reason for sickness among United States cavalry horses at General Custer's encounter with Indians at Little Big Horn.(12) Were Wyeth's horses affected by grazing in a seleniferous

area? The answer is not known. Today the well-stocked transcontinental trains roll through areas where plainsmen once made large accommodations in food habits.

Meanwhile the commercial and industrial centers were becoming more prominent. At the close of the Eighteenth Century city food supplies had been very primitive. Dairy products and fruits were carried to market at night. Cattle were slaughtered within city limits. There was little refrigeration. A dish made with rancid cream was served at George Washington's home in New York. "Mrs. Washington ate a whole heap of it".(13)

The country was close to the city and game was plentiful. According to the *Commercial Advertiser* of February 1, 1823, a bear, white hares, or a panther could be had in the New York city market. Among birds for food the white swan might be seen. Others included the grouse, the heath hen, the passenger pigeon, thrushes, wood-peckers and cedar wax-wings. Robin redbreasts were sold at so much a bunch. In 1860, New York legislated that game might be killed or birds trapped only within limited seasons.(14) Humane societies carried on educational work. Today songbirds carry out functions of beauty and insect control.

Fresh vegetables originally came to city markets chiefly from urban vicinities. Steam transportation meant cheaper foods and longer seasons for many articles. In Chicago, in 1849, the sowing of green peas in March merited a mouth-watering notice in the press. By 1852 an express service had been developed to and from New Orleans and the first green peas of the season, purchased at eight dollars a bushel, were served at the Tremont House in May. Two years later 20 quarts of strawberries appeared on the Chicago market in the same month. In July a rhetorical question appeared as to the source of a market supply of tomatoes. "The Bermudas", an editorialist answered. "Steamships and the railcar enable us to eat fruit with the inhabitants of those tropical islands, whole and sound. What will Pollock, [the market man], do next"? (15) By the beginning of the 1870's an enterprising Chicagoan was marketing delicacies shipped from the Pacific Coast by refrigerator car.

Improvements in canning and cold storage likewise made foods available over longer periods. Some canned foods were supplied to the Army during the Civil War. Troops in wartime, as in other conflicts, acquired tastes for hitherto unfamiliar foods. The development of the rail net provided wider markets for such things as packaged seeds, as Dr. Dove has mentioned. About five million cans of food were being put up annually in 1860; by 1870 the output reached 30 million cans. Pillsbury's XXXX flour, Domino sugar, Uneeda Biscuits and Quaker Oats were among processed foods advertised under brand names and distributed nationally.

Education as to food choices was aided by the government at the close of the century. Scientists had accumulated considerable knowledge regarding the chemistry of food, and, in the United States, Wilbur O. Atwater was a leader in the field. His work was followed with interest by Edward Atkinson, an industrialist interested in workingmen's diets. Atkinson advocated the establishment of food laboratories in connection with the agricultural experiment stations. Congress included in the agricultural appropriation bill of 1895 a sum to enable the Secretary of Agriculture to report on the nutritive value of food with "special suggestions of full, wholesome and edible rations less wasteful and more economical than those in common use".(16) With the advice of Atwater and Charles Langworthy of the Office of Home Economics surveys of diet were conducted among groups in various regions, including Maine lumbermen and Appalachian mountainers.(17)

Publications were issued by the federal government. The Extension Service aided educational work. Instruction in the southern states began with teaching the cultivation and use of a single plant, the tomato, and by 1916 included instruction in every fruit and vegetable grown in the South.(18) Newly discovered vitamins were given wide publicity in the work of the Food Administration during World War I. Professional organizations, the American Red Cross and representatives of many agencies participated in community educational activities during the 1920's. Technical improvements

during the period were many. The motor vehicle and the mail order house reached outlying sections. Periodical advertising increased and radio reached remote districts.

During the 1930's there was renewed interest on the part of local, state and national agencies in food habits. The administration of relief following the depression of 1929 in itself called for closer investigation of conditions. The distribution programs of the federal government were utilized by local and state authorities. Some regional differences in food habits appear in an analysis of facts collected by the Department of Agriculture and Labor in 1936-1937 as part of a study of American ways of spending and living at different income levels.(19) The fact that good diets might follow different patterns was borne out. It was found that skills in achieving good diets may be more pronounced among some families in one region than among others spending the same amount for food in another region. In the war years government service agencies and local committees had a large backlog of information from which to draw. At the same time scientific investigations received further impetus.

In point of time, opportunities for selection from a wider range of foods have increased. Regional differences have faded but have not disappeared. There is moreover a high degree of social consciousness with regard to food. In 1937, for example, the *New York Times* reported refusal of students in a southern college to attend classes. The administration, the students claimed, had insulted their pride by distribution of a pamphlet asserting that at home they ordinarily subsisted on a diet of three M's meat, meal and molasses.(20) The foundations of biochemical knowledge of the aspects of food consumption were early laid and have gone far in this respect. Knowledge of the biological, in a broad sense, or anthropological aspects of food consumption has also been greatly advanced. *The Manual for the Study of Food Habits*, prepared under the auspices of the Food Habits Committee of the National Research Council, contains a valuable bibliography of investigations.(21)

Data as to nutrition and food habits have accumulated rapidly. Formulae for readily breaking down statistics and evaluating diets in

terms of nutrients have been devised. Tests for qualitative aspects of nutrition such as Vitamin C adequacy have been developed. The matter of describing regional differences in food habits is complex, however. Factors or influences which have been touched upon include immigrant and group backgrounds, climate, local resources, technological development, urbanization, commercial merchandising, purchasing power and education. In general it may be held that the greater the listing of factors, the further the mention, within definition, of regional characteristics and customs.

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SIXTH SESSION

THE RELATION BETWEEN FOOD CONSUMPTION HABITS AND NUTRITIONAL STATUS

Friday, 7 December, 1945

CHAIRMAN
MAJOR GEORGE H. BERRYMAN,
Medical Nutrition Laboratory,
Office of the Surgeon General.

PRELIMINARY REPORT ON FOOD HABITS IN RELATION TO NUTRITIONAL STATUS

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For the past 11 years, studies on food habits and consequent nutritional status of human beings have been in progress at the Pennsylvania State College by staff members of the Ellen H. Richards Institute. These studies have made a contribution to the problem of regional and racial food habits and their relationship to physical wellbeing.

The Pennsylvania mass studies in human nutrition have included approximately 500 families, averaging 4.3 members to the family, as well as about 7500 children not included in the afore-mentioned families. These samples of the population have been selected on the quota system from different representative urban and rural parts of the state. The Department of Health of the Commonwealth sponsored the investigation since 1936, one year after its inauguration. The Philadelphia Child Health Society sponsored the studies in Philadelphia from May, 1941, through October, 1945, where the Children's Hospital of Philadelphia, a part of the Department of Pediatrics, School of Medicine, University of Pennsylvania, cooperated.

A railroad center, a college town, a small city in the heart of the anthracite coal region, four towns in two agricultural counties devoted to general farming, a large metropolitan center, and rural samples from four agricultural counties devoted respectively to general farming, dairy coupled with general farming, poultry farming and horticultural farming constituted the region in which the investigation was conducted.

Pennsylvania is a Commonwealth with a heterogeneous population. Food habits vary from one place to another within the state and from one group to another within a certain

locality. Mention of this state suggests the Pennsylvania Dutch. It is true that this important segment of the population within the state has certain distinct food habits, which involve unique methods of preparation of common foods rather than the use of unusual foods. The Pennsylvania Dutch have stemmed from many sources and hence are somewhat variable in their traditional food patterns. This group, with its own varied background, has exercised an influence on the eating habits of others in many parts of the state and has in turn been affected in dietary patterns by its neighbors. Because the Pennsylvania Dutch are chiefly a rural people, they have come in contact with other rural groups which in this state include those with such racial backgrounds as Scotch, English, Irish, Bohemian and Swedish. All have had a certain effect on each other.

The Pennsylvania human nutrition studies have shown that many factors determine food habits. Economic level and racial-national origin, coupled with the availability of certain foods in a given region, have been found to be of paramount importance in this connection. Desire to reduce weight, personal appetite idiosyncrasies, allergies and the like or dislike of foods prepared in certain ways contribute to the complicated background of food choices.

The studies have shown further that there is a definite relationship between many phases of dietary history and physical status. The tests of physical status included body proportions; skeletal status; dental status; condition of the soft tissues; blood values for hemoglobin, red cell count, hematocrit, Vitamin A, carotene, ascorbic acid, Vitamin E, phosphatase, total protein, and serum albumin; urine values for thiamin, riboflavin, and fluorescent substances related to niacin; certain chemical and bacteri-

ological tests on saliva; and such functional tests as those for dark adaptation, reflexes, and on some subjects fatigue and coordination. Certain dietary patterns were found to be associated with differences in body size, in body proportions, in skeletal structure and skeletal mineralization, in levels of nutrients in body fluids and in certain body functions.

Among the different aspects of physical status found to have a direct association with food intake is skeletal status. The size and anthropometric proportions of the skeleton reflect the entire dietary history of the individual. The mineralization of the skeleton at any one time is related to current dietary and physical status. Contrary to former belief, the skeleton is not relatively static but is a dynamic system which is changing continuously. According to a refined technique involving the tracing of X-rays of certain bones of the body by means of a microphotometer operating on the photoelectric principle, bone changes may be noted within a very few days following a radical change in dietary intake, or changes in body demands not accompanied by a proper increase in intake, such as those associated with injury, pregnancy or the initiation of a severe work regimen.

In attempting to effect a favorable change in dietary habits, through such media as the school lunch, or school or adult instruction, it has been found in Pennsylvania mass nutrition studies that racial and national-background is one of the most frequent obstacles militating against change. In the anthracite coal region, 102 racial-national groups were found, including those whose parents stemmed from the same or from different origins. In Philadelphia many of the same groups were found, and in addition those representing approximately 100 backgrounds have been tested. There were marked differences in many of the traditional dietary patterns of these various groups and there were group differences in responses to the nutritional tests, some of which undoubtedly were associated with food habits.

In the anthracite region, among observed trends in dietary habits and physical status were the following specific examples: the highest average dental score was that of the Negro; on the other hand, this group tended to

be low in hemoglobin, low in weight for the height and iliac width, low in medical scoring and low in certain blood levels. This race was very low in calorie intake, low in consumption of meat and milk, very high in intake of green vegetables and low in other vegetables and fruits. Unquestionably many factors of physical status were related to this peculiar dietary.

Syrian children were in advance of other children in certain respects but very low in others. Their dietary which was distinctive had many good and many poor characteristics. Russian and Lithuanian children were exceptionally low in caloric value with a proportionately high carbohydrate intake. Actually the carbohydrate intake was not of itself excessive except that the protein, fat and vitamin levels were lower in proportion to the recommendations than were those of starches and sugars. These dietaries were associated with poor responses to all of the nutrition tests. All were following the remnants of a traditional dietary, which perhaps was not optimum originally, and which had been considerably degraded through economic circumstances and through failure to find accustomed foods in a new land.

Another observation of a more general character was that children whose parents were from two national origins tended to have a wider variety of foods, and to give better responses to the nutrition tests than did those whose parents were of the same extraction. This may be explained by the fact that parents from different national background brought together a greater variety of food likes and food uses in establishing their homes than did parents of the same descent. In the latter case a wider variety of foods was used daily, and consequently more opportunity was afforded for meeting the needed quantities of all nutrients. This supply of essential nutrients in greater variety offers the most plausible explanation of the higher response to nutrition tests in general by the children of mixed parentage than by those whose parents were of the same national or racial descent.

The consumption of 12 major groups of foods by the children of mixed parentage, in comparison with those having both parents of the same national or racial extraction, matched in major

aspects only in about 10 percent of the cases. This shows that racial or national food habits tend to be lost when inter-marriages between those of different extractions take place. This fact is likewise related to the dissimilarity in results of nutritional status tests where both parents were of the same descent in comparison with those in which the two parents were of dissimilar descent.

It seems evident from the data that old habits cling even in the new land when two parents come from the same country, or from a race like the Jewish which retains its identity and habits to a considerable degree after centuries of departure from the land of its forefathers. This places a limitation upon the food varieties utilized since the new country may not offer the exact foods to which the two parents have become accustomed. When the parents have different national or racial origins there is brought into the family a larger total of food habits resulting, as can be seen from the data of this study, in wider food choices, a greater opportunity to obtain the needed nutrients and in better nutritional status of the children.

As a specific example of children of mixed parentage, the highest over-all ranking of any racial-national group in the anthracite coal region was that of children of German mothers and Irish fathers. These children scored relatively high in intake of meat, poultry and fish, including glandular organs; high in butter and other fats; high in vegetables, particularly tomatoes; and relatively high in milk, whole grain cereals, eggs and fruit. They surpassed children of Irish mothers and German fathers, as well as those whose two parents were Irish or German; this superiority was favored both in the scoring of their dietaries and in the scores received in their nutrition tests. There were similarities in their dietaries particularly with reference to certain peculiar dishes, both to those of children having one parent of German or Irish extraction.

One more specific example will serve to show the relationship of a traditional dietary to food choices and nutritional status of the children of persons transplanted to this country. A study of 73 Chinese elementary school children, attending a church school in Philadelphia, made

by Dr. Woot Tsuen Wu, disclosed results in poor physical status associated with an attempt to cling to a traditional dietary in a new land with extremely different foods on the market.

About one-fifth of the days' dietary, on the average, was polished rice with many individual meals composed of this food to the extent of three-fourths of their total weight.

Meat was eaten in very small amounts with roast pork ranking first, hamburger and other fried meat cakes second, frankfurters third, and fried pork chops fourth. Milk and egg consumption was low, as was that of fruits and vegetables. Chinese cabbage and other vegetables similar to those found in south China were used in larger amounts than those which were not found extensively in that part of the native country.

Only a small percentage of the children met the standard energy intake and/or protein intake recommended by the Council on Public Health, Committee on Nutrition, Chinese Medical Association, or of the major vitamins and minerals recommended by the National Research Council of the United States, even after tentative modifications were made to account for body size and other factors.

The results of the nutrition observations and tests showed the children to be in very poor physical status. For example the medical examinations revealed these facts:

- 34.0 percent exhibited skin lesions of one type or another;
- 6.8 percent lesions of the mouth;
- 8.0 percent lesions of the angles of the lips;
- 5.5 percent severe gingival lesions;
- 43.8 percent mild past rickets; and
- 4.1 percent severe past rickets;
- 12.3 percent heart irregularities, including irregularities of rhythm, abnormalities in sound or rate;
- 16.4 percent extremely poor muscle tonus;
- 73.5 percent mild xerosis of the conjunctiva;
- 10.3 percent severe xerosis of the conjunctiva; and
- 11.4 percent thickened areas on the conjunctiva.

The pediatrician rated none of the children as in optimum physical condition; skeletal mineralization was very poor in most of the children; salivary bacterial counts were high;

the sum of decayed, missing and filled teeth divided by the number of permanent teeth averaged 0.40 a high value for grade-school children.

Nutritional anemias of several types were shown. Only 6.9 percent were adjudged to be free of nutritional anemia. Average blood values of most nutrients for which measurements were made fell below a desirable level as far as present knowledge goes.

The dietary pattern was a fragmentary remnant of middle class Chinese in South China. The pattern had been pieced out by the adoption into the family's as well as the individual child's dietary of hot dogs, soft drinks, popsicles, pretzels, chocolate bars and other snack foods which Chinese children had seen American children eating on the streets.

Hope for the possibility of favorable change in dietary habits springs from the fact that changes have been found among those of every racial-national group which has been studied. Throughout all of the groups, a thread of similarity appears in the dietaries of some subjects, with children of every background having breakfast of coffee or tea with a bun; lunches of sandwiches, potatoes, cake and a soft drink; and suppers of frankfurters, potatoes and pie. If Irish, Lithuanians, Negroes, Dutch, English, Polish and any other group which one might name could reach a common denominator on a poorly balanced dietary, improvement is possible, and the responsibility for directing this change into favorable channels rests with those who are teaching better nutrition.

NUTRITIONAL STATUS AND FOOD CONSUMPTION OF RURAL CHILDREN IN OREGON

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From 1942 to 1944 a study of the nutritional status of rural children in Oregon was carried out. It was impossible to do complete studies of nutritional status, but hemoglobin and plasma ascorbic acid determinations were made, certain physical measurements taken, and each child kept a record of food consumed for a week.

The study was carried out in five counties representative of different parts of the state. Marion County, in the broad Willamette Valley, has a mild climate, dry in summer and wet in winter. Diversified farming, fruit and nut growing and some logging are carried on. Josephine County, in southern Oregon, is more or less mountainous with logging and mining in the mountains and fine fruit and flower farms in the irrigated valleys. Tillamook County, on the coast, has a dairy and cheese industry, fishing in the bay and ocean, and logging in the hills. In northeastern Oregon, Sherman County grows wheat almost exclusively. It has a dry climate, cold in winter and hot in summer, with not enough water usually for even a kitchen garden. The farmers in that county live more like city people and buy almost all of their food. In the southeastern corner of the state, Malheur County is also dry except for an irrigated district. Cattle and sheep feed on the range

throughout most of the county. In the irrigated portion sugar beets, alfalfa, melons and tomatoes are produced.

The data were collected during the school year. In each county a list of schools was obtained and every fifth school was selected. In each school 10 percent of the children were chosen at random. In Sherman County all of its five schools were used.

At least two tests were made on each child, usually a week apart. If the results of the two tests did not agree, they were not counted.

Hemoglobin determinations were made by the acid hematin method,(1) readings being made in a standardized Evelyn photoelectric colorimeter. Plasma ascorbic acid was determined by the method of Farmer and Abt.(2)

Average hemoglobin values are shown in Table I, divided according to age and sex. Below the age of twelve, the average values for boys and girls showed no difference, both averaging just less than 14.0 grams per 100 milliliters. The boys, however, showed increasingly higher average values from the age of 12 on. The girls showed no such rise in hemoglobin.

TABLE I
Average Hemoglobin Values of Children By Age and Sex

Age in Years	No. Subjects	Boys		Girls	
		Average Hemoglobin gm./100 ml.	No. Subjects	Average Hemoglobin gm./100 ml.	No. Subjects
8 - 11	47	13.93	52	13.99	
12 - 13	73	14.22	86	13.98	
14 - 15	54	15.08	52	14.03	
16 - 18	26	16.18	46	13.99	

Table II gives the percentage of boys and girls with values below 10, 11, 12, 13 and 14 grams of hemoglobin per 100 milliliters, respectively.

TABLE II
Percentage of Subjects with Hemoglobin Values Below Certain Levels, by Age and Sex

Age	Boys					
	Below 10 gm./ 100 ml.	Below 11 gm./ 100 ml.	Below 12 gm./ 100 ml.	Below 13 gm./ 100 ml.	Below 14 gm./ 100 ml.	
8 - 11	0	0	0	6.5	60.0	
12 - 13	0	0	1.4	12.3	56.6	
14 - 15	0	0	0	0	20.4	
16 - 18	0	0	0	0	0	
Girls						
8 - 11	0	0	1.8	7.4	37.0	
12 - 13	0	0	1.4	18.9	65.3	
14 - 15	0	0	2.1	10.6	55.3	
16 - 18	2.3	4.6	6.9	13.8	39.5	

None of the values for the boys fell below 11 grams, and only one boy in the 12 and 13 year age group showed a value below 12 grams. None of the boys 14 years old or more had values falling below 13 grams, and none of 16 or more years, below 14 grams. These values are higher than those reported from some other parts of the country.

More of the girls showed lower hemoglobin values. One girl's level fell below 10 grams and another value fell between 10 and 11 grams. Several values for girls were below 12 grams, and many more below 13 grams, while over

half of the girls from 12 to 15 inclusive showed values of less than 14 grams per 100 milliliters.

It was interesting to observe that while there was little difference in average hemoglobin values among the girls in the different counties, the hemoglobin values for the boys in Sherman County showed higher values at a lower age than in the other counties. This coincides with a higher intake of meat and eggs in that county.

In studying plasma ascorbic acid values, no difference was observed between those for boys and for girls at the younger ages. After 13 years, girls tended to show higher average values than boys, the differences approaching significance.

Table III gives average plasma ascorbic acid values divided according to age. The children of 11 or less displayed higher average values than older children. This tendency is also

TABLE III
Average Plasma Ascorbic Acid Values According to Age

Age Years	Number Subjects	Plasma Ascorbic Acid mg./100 ml.
8 - 9	9	0.61
10 - 11	89	0.63
12 - 13	143	0.52
14 - 15	92	0.42
16 - 17	56	0.52

shown in Table IV, in which the percentages of subjects with plasma ascorbic acid values below different levels are given. Whereas 32

TABLE IV
Percentage of Subjects with Plasma Ascorbic Acid Values Below Different Levels By Age

Age	No. Subjects	Below 0.60 mg./100 ml.	Below 0.40 mg./100 ml.	Below 0.20 mg./100 ml.
8 - 11	89	42.9	20.4	4.1
12 - 13	138	68.7	32.1	5.8
14 - 15	95	73.7	55.8	13.7
16 - 18	56	59.1	47.6	4.9
Total	378	59.9	35.8	6.4

percent of the children 12 and 13 years of age showed values below 0.40 milligram per 100 milliliters, 56 percent of those 14 and 15 showed values below that amount. There was a direct correlation between the numbers of servings of citrus fruits and tomatoes, and of other raw fruits and vegetables, and plasma ascorbic acid values. The younger children consumed more citrus fruits and tomatoes than the older children.

In Malheur County, plasma ascorbic acid determinations were first made in September, which coincided with the tomato and cantaloupe season in the irrigated portions. The average plasma ascorbic acid value at that time was 0.72 milligrams per 100 milliliters. It was then necessary to stop examinations before enough subjects had been studied because some of the schools were closed so that the children could help in the sugar beet harvest. The work therefore waited until the following spring. Some of the same subjects were seen, as well as additional ones. This time the average plasma ascorbic value amounted to 0.35 milligrams, just half what it had been the previous fall.

reflect in large part the family preferences and food habits, although evidences of adolescent independence are apparent also. In Table V are listed certain foods or food groups, with average numbers of servings per week consumed by the children in the separate counties. Milk consumption for the whole study averaged 15.9 cups per week, used as beverage, in cocoa, or on cereal or desserts. No attempt was made to evaluate the amount used in cooking; however, few milk soups or milk puddings appeared on the records. The range of consumption was from none to 53 glasses per week, 40 percent of the children taking less than a pint a day, and 74 percent, less than three glasses a day.

The use of eggs reflected seasonal changes in availability. The use of meat and fish or poultry remained quite constant throughout the school year and few children ate less than five servings per week.

Particularly worthy of notice is the high consumption of fruits and vegetables, which confirms casual observation. Servings per week averaged 26.4 to 32.8 in the different counties.

TABLE V
Average Consumption of Certain Food Groups by
Counties in Servings per Week

	Marion	Josephine	Tillamook	Sherman	Malheur
Milk, cups	14.9	19.1	14.1	20.7	13.6
Cheese	1.3	1.7	1.0	0.9	1.9
Eggs	3.3	3.4	3.9	7.0	6.2
Meat, fish, poultry	7.9	9.4	10.9	10.9	9.5
Citrus fruits & tomatoes	4.4	3.3	4.3	5.1	7.0
Raw vegetables	2.7	2.5	1.7	3.1	1.4
Other raw fruits	4.2	5.7	2.3	0.9	0.3
Potatoes	7.4	6.7	7.3	6.6	6.6
Cooked vegetables	7.1	8.1	7.0	6.3	7.2
Cooked fruits	6.0	6.5	5.8	5.7	3.9
All fruits & vegetables	31.8	32.8	28.4	27.7	26.4
Dry peas & beans	1.5	1.3	1.1	1.4	0.9

In general, higher plasma ascorbic acid values were observed in communities that were predominantly farming than in mining or logging communities.

The food consumption records contained some interesting indications. They undoubtedly

Table VI shows the relative popularity of the different vegetables. White potatoes form the mainstay of the vegetable supply, being served on the average of once a day. Raw vegetables and salads are popular, appearing 1,329 times in 3,202 days' records. Among cooked, canned and frozen vegetables, peas, corn, green beans

TABLE VI

Numbers of Servings of Vegetables in 3,202 Days' Records

RAW		COOKED	
lettuce	435	squash	50
carrots	226	parsnips	49
cabbage	182	asparagus	39
celery	133	sweetpotato	34
salads, mixed	353	onions	33
		cauliflower	31
potatoes	3,206	turnips	22
peas	448	broccoli, green	16
corn	441	"greens"	14
beans, green	392	rutabaga	13
carrots	303	succotash	8
beets	99	chard	7
spinach	96	eggplant	5
cabbage	92	kale	2
sauerkraut	67	Brussels sprouts	1

and carrots are by far the most popular. Greens of various kinds were used in the spring, and asparagus when it was in season, which season did not coincide with the period of this study to any extent. Little asparagus was canned or frozen.

Fruit was used in abundance, as shown in Table VII, being served on the average 1.8 times per day, not including fruit pies or puddings.

TABLE VII

Numbers of Servings of Fruits in 3,202 Days' Records

RAW	COOKED or CANNED
oranges	1,007
tomatoes	966
apples	944
grapefruit	308
peaches	162
bananas	94
melons	90
grapes	89
pears	36
berries	31
avocado	13
	peaches
	apples
	prunes
	pears
	berries
	cherries
	apricots
	pineapple
	raisins
	rhubarb
	figs & dates
	cranberries

The school year did not include much of the time when fresh peaches, pears, cherries, berries and melons were available. Summer records would almost surely show a large consumption of these fruits as all are abundant when in season. Most of the canned fruits were prepared at home. Apples are grown in many parts of the state and are available anywhere. The main fruit crop in addition are peaches, pears, cherries, prunes and berries. Of these

only the berries could be considered good sources of ascorbic acid. Tomatoes are, however, grown commercially in many sections.

These food records help to explain the relatively high hemoglobin levels of Oregon children, with the liberal use of meat, fish, poultry and eggs. As far as plasma ascorbic acid levels are concerned, it apparently is possible in most of these areas to achieve high values, but these are not always attained because of the choice of fruits and vegetables. In the western part of the state it is possible to have winter gardens with green broccoli, cauliflower, cabbage, kale and Brussels sprouts ready for cutting all winter, as well as the root vegetables. Many of these are excellent sources of ascorbic acid. The Extension Service is encouraging the growing of such winter gardens. It also encourages the greater use of milk by farm families.

Some general impressions on food habits have also been gained which have not yet been confirmed by actual data collected. Beef is by far the preferred meat, lamb being rather unpopular, and pork well liked but not as obtainable as beef. Fish is used mainly on the coast. Turkeys and chickens are produced in large numbers but ducks are rarely seen. Jams and jellies are extremely popular when sugar is available to make them. Game is important in certain parts of the state for supplementing the supply of other meats.

Foreign influence is not very apparent in food habits in the state. Ninety-one percent of the population, according to the 1940 census, is native born. A small colony of Basques are shepherds and cattle ranchers in southeastern Oregon, and there is a Finnish colony at Astoria near the fish canneries. Chinese and Japanese make up the remainder of the foreign-born population.

No study has been made in Oregon of Indian food habits, so far as is known.

Much more detailed studies of food habits could well be carried on with benefit to those who are teaching and helping to plan agricultural programs.

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THE EFFECTIVENESS OF THE SCHOOL LUNCH IN IMPROVING NUTRITIONAL STATUS¹

by DR. OUIDA D. ABBOTT, *University of Florida, Department of Home Economics, Gainesville, Florida.*

A five-year study has been made of the effectiveness of a school lunch in improving the nutritional status of the children in the Day School. This school was located in Lafayette County, Florida, about 14 miles from the county seat and six miles from a main highway. About 80 farm families lived in the community, of which nearly three-fourths were farm owners or tenants of long standing. Of the family's food supply, staples were the principal items bought; each farm produced most of the other foods. Nutritional diseases of cattle were endemic to the area and from a cursory examination of the children it was evident that problems in human nutrition also existed in the county.

From September, 1940, until April, 1944, the noon meal was planned and prepared under the direct supervision of the department. This meal, planned according to optimal standards, furnished at least the minimal daily allowances of essential food factors. From October, 1944, until April, 1945, the noon meal was planned by the supervisor but the purchase of the food and the supervision of the lunch room was undertaken by the school principal.

Since there were no standards for nutritional deficiency diseases that showed the rate of progress, the degree of severity or involvement, definite conditions were designated as the basis for comparison. Data presented show the incidence of defects or diseases in all of the 186 who had the prescribed examination. The prevalent defects or diseases were caries, defective tonsils and diseases of nutritional origin. It was found that 90 percent of the group had

gingivitis, 70 percent anemia, 70 percent conjunctivitis, 67 percent cheilosis and angular stomatitis, and 47 percent skeletal defects.

This initial examination which showed the incidence of defects or diseases, the degree of severity or involvement, the physical status and developmental age, furnished the baseline for estimating the effective results of the special noon meal. Each succeeding examination gave a new norm, thereby making it possible to follow not only the yearly trend of the group but also the progress or regression of the individual.

The effect of the noon meal on average body build and average developmental age was shown by comparing the basal curve for 1940 with the curves for 1942 and 1944. With better food there was a shift in channels towards better physique and a change in developmental level from a lag to a lead.

The results of the examination in 1940 with reference to the degree classification of the prevalent nutritional defects are compared with those of 1942, 1944 and 1945. The principal effect of the noon meal noted in this presentation is the shift in norm distribution around a pronounced clinical deficiency to a norm around a condition of sufficiency.

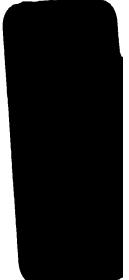
During the first four years of the experiment, hemoglobin value of both sexes increased during the school year and then decreased during vacation. Data collected during the fifth year did not follow this pattern. The hemoglobin values of both sexes and at all ages showed a downward trend. The drop in hemoglobin which occurred during this year caused a major shift in distribution while only small changes

¹ Abstract of a paper presented at Food Acceptance Research Conference.

occurred around the other norms. The facts indicate that the diets during the fifth year were fairly adequate in Vitamins A, C and riboflavin, but that the factors necessary for regeneration of hemoglobin were inadequate.

From this work the conclusion was reached that when competently supervised, when

planned to take care of known food deficiencies, and when special attention and supplementary vitamins and minerals are given when necessary, the school lunch offers an effective means of raising the nutritional status of school children.



FOOD HABITS AND NUTRITIONAL STATUS STUDIES IN NORTH CAROLINA AND TENNESSEE

by DR. WILLIAM J. DARBY, *Vanderbilt University, School of Medicine, Nashville, Tennessee.*

This paper will present some of the findings which have resulted from several nutrition surveys in Tennessee and North Carolina, with especial emphasis on the dietary data. These studies were all made since 1939 and are cooperative undertakings of Vanderbilt University, the International Health Division of The Rockefeller Foundation, the Tennessee Department of Public Health, and the Nutrition Foundation on one hand, and Duke University School of Medicine, the North Carolina State Board of Health, and the University of North Carolina, on the other.¹

The nutrition survey is comprised of three investigations; *i.e.*, dietary, laboratory, and physical examinations. The aim has been to assess the nutrition of a population either by examining all or a representative sample of the population. In the Tennessee surveys the total cooperating population was studied. In North Carolina, by statistically valid means, a representative sample of some three percent of the population was selected to be surveyed.

The dietary data were calculated from dietary records which the subjects kept for a period of one week. All food and drink consumed over a seven-day period was recorded on a form provided the individual and the identity and quantity in household measures was recorded. A trained nutritionist instructed the persons in the methods of recording, sometimes visited the homes frequently to assist in the task, and always checked the record with the subject at the completion of the week. The

nutritionist converted the household measures into metric quantities and, by means of widely used food tables, calculated the average daily intake of each of the many food factors. It is recognized that a one-week dietary is not necessarily representative of the 52 weeks of the year for the given individual. However, a large series of one-week records obtained consecutively within a population gives a true picture of the dietary pattern of that population, although it may not characterize a single individual within the group. The definite seasonal patterns which recur bear out this theory. Likewise, in less extensive studies currently under way the data lead to the suggestion that there are some patterns which recur at given stages of pregnancy among the subjects in the pre-natal clinic.

This method of dietary study has been criticized. It has not the accuracy of animal feeding experiments. Many are skeptical regarding the reliability of this method, but a close examination has forced the conclusion that in these surveys the procedure has given a very close approximation of the true dietary habits of the region. This conclusion is based largely upon the following points:

The method gives reproducible results. Thus in every extensive study in this region the average caloric intake for adult white women has been from 1600-1900 calories and for adult white men 2000-2500. Comparable populations have shown closer agreement than the range of all of the means indicate but the sex differential has held throughout.

The validity of the interpretation of the dietary record by the nutritionist and of the application of the food tables are indicated by

¹ The data here presented were assembled by many persons including Col. John B. Youmans, Dr. E. White Patton, Dr. W. D. Robinson, Dr. D. F. Milam, Dr. Margaret Kaser, Miss Ruth Steinkamp, Miss Alla Meredith, Miss Pauline Jones, and others.

a comparison of calculated values with analytically determined quantities for a group of representative diets. These and other figures

were obtained in the laboratories at Vanderbilt. The indicated agreement is even better than one would predict.

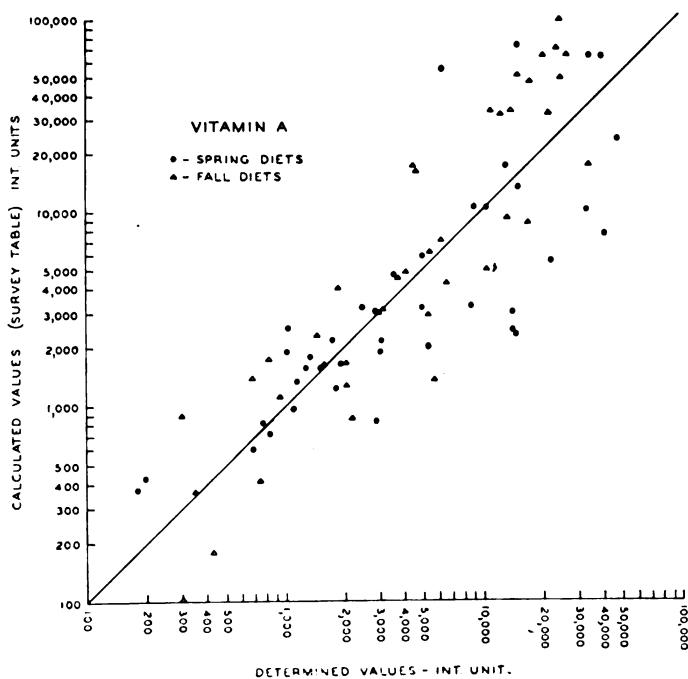


Figure 1

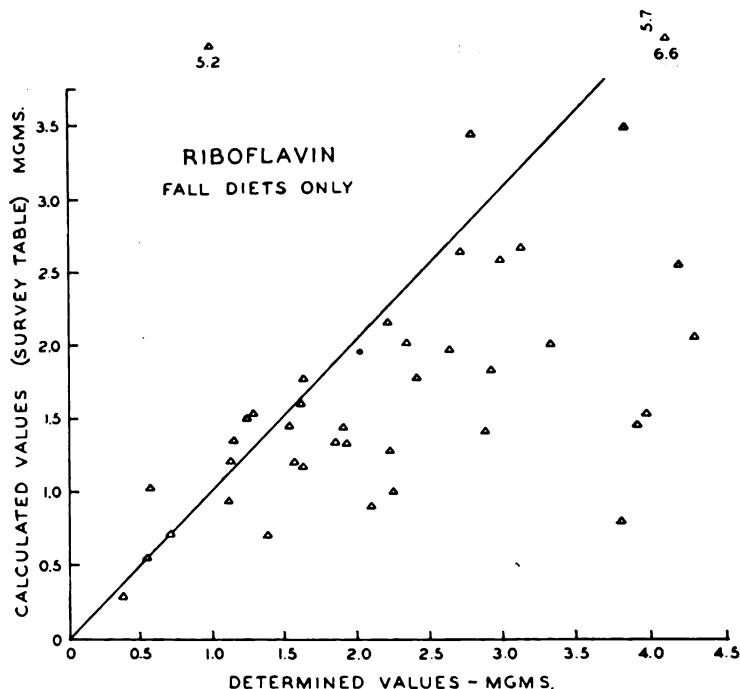


Figure 2

The table calculations have been further applied to some of the diets employed in certain classi-

cal nutritional experiments where some of the food constituents were analyzed as part of the experiment.

TABLE I
Determined and Calculated Caloric Values
for Ten Spring Diets for One Day

Diet No.	Determined	Calculated		Difference Survey-Determined	Difference State Table-Determined
		Survey	Table	State	Table
145-4	603	681	681	+ 78	+ 78
146-2	618	626	624	+ 8	+ 6
285-1	1601	1793	1705	+192	+104
130-1	1632	1616	1578	- 16	- 54
136-2	2517	3071	3000	+554	+483
139-3	2700	2175	2137	-525	-563
151-5	2713	2519	2441	-194	-272
142-1	3420	2990	3026	-430	-394
149-1	3735	4604	4598	+869	+863
136-4	3833	3392	3479	-441	354
Mean	2337.2	2346.7	2326.9	+ 9.5	- 10.3

Some representative data from Benedict's monograph on "Human Vitality and Efficiency Under Prolonged Restricted Diet" were calculated by a nutritionist, employing the food tables upon which our calculations are based. The values compare as follows:

Calories		Protein	
Analyzed	Calculated	Analyzed	Calculated
2559	2549	80.3	84.2
1555	1576	54.9	56.0

Such agreement reassures one of the validity of the method.

Another factor in the conviction stated is the sheer reasonableness of the data; reasonableness now that it is viewed objectively. Thus, in these surveys there is not one case of clinically manifest Vitamin A deficiency. On a mean intake of 4,000 to 6,600 International Units it

would be unreasonable to expect deficiency manifestations. Similarly, Chittenden's classical experiments on groups of athletically active young men found weight maintenance without physical impairment on a caloric intake of 2285 calories per day. Compare this with the findings of a mean caloric intake of 2568 calories for the men in Alamance County, North Carolina, or of 2581 calories for the men in Wilson County, Tennessee.

Finally, the variations in mean intakes so determined are in the direction which objective laboratory measures indicate that they should vary. For example, seven to nine year old children in two Nashville schools were surveyed. These schools were chosen by the School Health Service as representing opposite extremes of the economic groups in the city. The following data indicate the parallelism of dietary intakes and objective measures on these two groups:

TABLE II
**Nutritional Assessment of White Children,
Age 7-10, in Three Tennessee Schools**

Assessment	High Economic Area		Low Economic Area		Lower Economic Area	
	Sex	Mean	Sex	Mean	Sex	Mean
Per cent of Standard Weight	M-F	105.0+1.6	M-F	97.2+0.7	M-F	89.4+1.9
Caloric Intake	M	1931+73.4	M	1842+43	-	--
Caloric Intake	F	1850+58	F	1745+38	-	--
Percentage of Calories from fat	M-F	41.4+0.5	M-F	38.5+0.03	-	--
Total Protein Intake - gms.	M-F	68.2+1.7	M-F	59.5+1.1	-	--
Calcium Intake mg.	M-F	1193+34	M-F	889+23	-	--
Iron Intake - mg.	M-F	11.7+0.36	M-F	10.8+0.19	-	--
Total Vitamin A Intake - I. U.	M-F	6429+436	M-F	3793+169	-	--
Thiamin Intake ug.	M-F	1188+47	M-F	1076+20	-	--
Niacin Intake mg.	M-F	9.8+0.35	M-F	8.6+0.2	-	--
Riboflavin Intake ug.	M-F	2452+71	M-F	1895+46	-	--
Ascorbic Acid Intake - mg.	M-F	67.2+3.7	M-F	36.6+1.6	-	--
Serum C - (mg. percent)	M-F	0.814+0.070	M-F	0.493+0.029	M-F	0.42+0.074
Serum Carotene (ug. percent)	M-F	151.9+7.29	M-F	95.8+3.0	M-F	105+9.18
Serum Vitamin A (I. U. percent)	M-F	93.0+3.6	M-F	95.7+2.3	M-F	77.5+8.62
Serum Albumin (gm. per 100 cc)	M-F	4.96+0.037	M-F	4.97+0.022	-	--
Hematocrit (percent)	M-F	40.98+0.31	M-F	40.55+0.148	M-F	41.0+0.375
Hemoglobin Sample 1 (gm. per 100 cc)	M-F	13.30+0.10	M-F	12.94+0.06	M-F	13.3+0.14

Emphasis has been placed on the validity of this approach because too often the assumption has been tacitly made that the method had the precision of a direct analysis, or conversely it has been dismissed as a procedure worthy only of a pseudo-scientist desiring data for propa-

ganda purposes. Obviously both extremes are wrong. The method is useful and valuable when properly applied to populations. It has much less value in evaluating the nutriture of a single individual.

The data to be presented henceforth are from surveys made in Wilson County, Tennessee, in 1939-41 on a whole rural and village population.

Williamson County, Tennessee, in 1943-44 on a rural population.

Chatam County, North Carolina, in 1940-41 on the population of a mill village.

Wayne County, North Carolina, in 1942-43 on a rural population.
Alamance County, North Carolina, in 1943-44 on an urbanized rural population.

It should be pointed out that each of these studies, except the Williamson County one, involved large groups of persons. The mean figures for the Williamson County area are based on some 18 men and 31 women. This is believed to account for the differences in these and the other means.

TABLE III
Average Intakes

	Calo- ries	Fat Gm.	Protein Animal Gm.	Ca. Gm.	Fe Mg.	Ascorbic Acid Mg.	Vit. A I. U.	B, Mg.	Ribo Mg.	N. A. Mg.
Wilson County, Tennessee 1939-1941										
White Adult Males	2581	103	82	0.8	14.7	75	6969	1.2	1.45	-
White Adult Females	1736	67	56	0.6	10.6	68	6294	0.8	0.9	-
Williamson County, Tennessee 1942-1943										
White Adult Males	3122	-	58.3	1.23	16.1	48	7111	2.1	2.8	14.1
White Adult Females	1974	-	34.9	0.88	11.3	38	5492	1.3	2.0	8.5
Chatam County, North Carolina (Mill Village) 1941										
Adult Whites	2061	95	58.0	0.77	10.7	60*	4950	0.81	1.39	-
Wayne County, North Carolina 1942-1943										
White Adult Males and Females	1954	-	61.2	0.60	10.1	24.4*	5138	0.98	1.12	-
Alamance County, North Carolina 1943-1944										
White Adult Males	2568	116	81.8	1.02	15.2	40.3*	6595	1.32	1.88	11.8
White Adult Females	1847	83	58.7	0.68	11.4	38.0*	5113	1.01	1.29	9.1

*Calculated on raw foods only

The caloric intake has been discussed. One point bears emphasis: obesity occurs in a significantly large proportion of the adults. Note the data from Alamance County.

TABLE IV
Percentage Incidence of Under- or Over-weight
Individuals, Alamance County, North Carolina,
1943-1944

Age	WHITE			COLORED			Total No. Examined
	Underweight	Overweight	Total No. Examined	Underweight	Overweight		
Under 15 Yrs.	Percent	Percent	350	Percent	Percent		107
Under 15 Yrs.	14.3	4.3		11	6		
Over 15 Yrs.	22.3	16.4	339	12	19		98
Total	18.4	10.7	739	12	12		205

Note the constant level of caloric intake, the satisfactory fat consumption and, except for Williamson County, a good level of protein and calcium consumption.

Iron intakes are at a reasonably satisfactory level, despite which there is a fair amount of hypochromic anemia among the women of the region. This does not indicate a need for an increase in the dietary iron consumption; rather it may mean that the practicing physician in the region should be more alert to the possibility of iron deficiency due to excessive loss which is conditioned by repeated pregnancies, pregnancy losses, menorrhagia and bleeding hemorrhoids.

The mean ascorbic acid intake is not alarming. It varies with the season; high in summer and fall, lower in winter and spring. The indicated intake is well above the scorbutic level. Adult scurvy is almost never encountered in this region. No valid correlations have been found between ascorbic intake or plasma levels and the occurrence of gingivitis. Hence it would seem that there is no objective evidence of any considerable ascorbic deficiency in this population.

Vitamin A has been discussed. The high levels of intake are confirmed by all of the evidence.

Thiamin intake, even before the enrichment program, is definitely above the safety margin of 0.23 mg. per 1000 calories. The mean riboflavin intake likewise is in a satisfactory level; in agreement with the calcium intakes, since both these elements are largely derived from milk and greens.

The nicotinic acid intakes are difficult to evaluate. They vary considerable, but are lower than the RDA 15 mg. per day. In some instances the means are almost identical with the intakes of Goldberger and Wheeler's subjects who developed pellagra. Despite this fact, pellagra has practically vanished from the South. Thus in Tennessee the cases reported yearly decreased from 662 in 1932 to 142 in 1941 and 69 in 1944. North Carolina sustained a more striking decrease: from 831 in 1936 to 12 cases in 1944. This decrease may well be accounted for by the simultaneous drop in the

consumption of cornmeal, if the recently revised zeistic theory of the origin of pellagra is accepted. Thus the Goldberger-Wheeler pellagrins consumed cornmeal and hominy to the extent of 30 percent of the calories of their diet; in Wayne County, North Carolina, where the niacin intake was identical with that of these pellagrins, cornbread constituted but 5.5 percent of the dietary calories in 1942-1943. Pellagra was not seen in the survey subjects. Truly the diversification of the diet which has occurred in the last few years would seem to be a most important factor in the now encouraging nutritional picture as it has been presented.

What are the sources of these nutrients and how varied is the diet in one of these regions? The following list of foodstuffs will give an answer to this question.

TABLE V

Average Daily Intake of the Adult White Male
Alamance County, North Carolina, 1943-1944

Cereal Grains	
White bread	7 ounces
Corn bread	1/2 ounce
Cereals	1 ounce
Dairy Products	
Milk	1 pint
Cheese	1/6 ounce
Ice cream	1 ounce
Fats	
Butter	1/2 ounce (1-2 pats)
Lard	1/2 ounce
Other fats	1/2 ounce
Eggs	1 egg
Nuts	
Peanuts	1/5 ounce
Meats	
Lean pork	3/4 ounce
Fat pork	1/2 ounce
Beef	2/3 ounce
Fish	1/3 ounce
Fowl	1/3 ounce
Organ meats	1/10 ounce
Other meats	1/10 ounce
Vegetables	
Irish potato	2 ounces
Sweet potato	1 ounce
Tomato	1-1/2 ounces
Corn	3/4 ounce
Green leafy vegetables	1/2 ounce
Other green vegetables	1-1/2 ounces

TABLE V (Cont'd)

Yellow vegetables (except sweet potato)	1/6 ounce
Peas and beans (dried)	1 ounce
Other vegetables	1/3 ounce
Soup	1/2 ounce
Fruits	
Citrus	1/2 ounce
Dried fruits	1/6 ounce
Other fruits	2 ounces
Sweets	
Molasses	1/4 ounce
Cakes and pies	2-1/3 ounces
Other sweets	1 ounce

This list is the average per capita intake in foodstuffs for the adult males of Alamance County in 1943-1944 as revealed by these studies. The variety and abundance of this diet is a far cry from the meal, meat, and molasses diet which nutrition-minded persons mistakenly attribute to this region. The day of that fare is passed forever, it is hoped.

In summary then the dietary intake of the adult population which has been studied in this region is at an adequate level which maintains a very high percentage of the adult population within or above that zone of nutrition, which Dann and Darby have termed "unsaturated but functionally unimpaired." The three outstanding problems within a proportion of this group are obesity, conditioned iron deficiency, and inadequate dental care. These latter two problems are actually part of the broader one of medical care.

Of very great importance in terms of health of the future adults is the nutriture of the children of the region. Time will permit only the making of two points concerning this:

1. The poorer dietaries are obtained in the groups in which one would expect; *i.e.*, the economically and educationally poorer group.
2. The physical and laboratory findings parallel the dietary records to a reasonable extent.
3. Underweight is prevalent in certain localities which are lacking in community and school spirit, a lack reflected in inade-

quate school lunch programs and inadequate child care generally.

4. Adequate dental care for any considerable percentage of children is found only among the children from the highest economic group.
5. There are found almost no specific signs or evidences of clinically manifest deficiency diseases within the child population except underweight and, perhaps, iron deficiency.

Of similar importance is the nutrition of pregnant and lactating women. An examination of the data shows that:

1. There is little tendency for pregnant or lactating women to increase their intakes of any factor except calories.
2. Lactating women increase their calorie intake by some 400-500 calories.
3. There often occurs a caloric deficit in the lactating group because these women weigh less than comparable non-pregnant-non-lactating women.
4. The iron loss to the fetus and during delivery which is not immediately replaceable from food without supplementation is reflected in a slightly but constantly lower hemoglobin and PCV in lactating women than in the non-pregnant-non-lactating group.
5. The failure to increase intakes, in the face of increased demands and losses during lactation, results in lower-than-usual mean serum ascorbic acid levels. An education program among physicians and their patients might well emphasize these problems of dietary needs during pregnancy and lactation.

In summary the nutritional surveys in the Tennessee-North Carolina region indicate that the population is above the zone of clinically manifest deficiency diseases and that some of the persons are in the zone of latent or unpending deficiency disease. A great majority of the population is in the zone of unsaturated but functionally unimpaired.

The chief problems appear to be obesity, conditioned iron deficiency and inadequate dental care in adults; in pregnant and lactating women the failure to readjust dietary habits to meet the increased requirements and the failure

to use iron protectively as it should be; in children, undernutrition in certain groups, possibly also low iron intakes. In all groups the lack of dental care is appalling.

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